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The Selden Automobile Patent.

In another part of this paper is printed a letter from Mr. Towle in which he takes issue with our expression of opinion on the Selden patent. Perhaps his view (which is the one generally held by those who may have to pay, directly or indirectly, for the use of the devices covered by the patent) is the correct one and ours is wrong; but however that may be, it will be conceded, we think, that a method of legitimately evading the patent or one that will enable internal-combustion-motor-driven vehicles to be built independently of the Selden patent is likely to prove of more importance than any discussion of the ethics of the matter.

The Selden patent, as we understand it, or at least the vital part of it, includes a clutch or some disconnecting device by means of which the motor may run without moving the vehicle. In a recent issue of "The Horseless Age," Mr. Dieterich, the inventor of the speed-varying device, illustrated and described in our No. 47, last year, calls attention to the fact that, with his device interposed between a motor and the driving wheels of a carriage, the ratio of speeds can be reduced by the movement of a lever to zero. When this is done it is, of course, evident that the motor may continue to run while the vehicle stands still, or may be started without moving the vehicle and all the purposes for which a clutch is used may thus be accomplished without a clutch and without using a "disconnecting device."

However, it is possible that the courts may decide that a speed-varying device by which the motion of the motor may be made to have no effect upon the vehicle, or to have an effect upon it at the will of the operator is essentially a disconnecting device or clutch and an infringement under the doctrine of mechanical equivalents; but Mr. D. meets this point by calling attention to the fact that the ratio may readily be made so low as to move the vehicle, say, one foot in an hour, in which case there would be no actual disconnection, but most, if not all, the purposes for which motors are disconnected from the driving wheels would be accomplished.

It seems not unlikely, therefore, that instead of being confined to the use of one patent, at least two may be used and that unless both these eventually fall into the hands of the same parties competition between them will make the terms somewhat different from what they otherwise might be aside from the fact that a speed-varying device that would be under perfect control, with which speed ratios could be changed without steps and without stopping or disconnecting would probably be a useful feature of such an automobile anyhow.

The Pratt & Whitney Company Purchased.

After about six months of negotiations and arranging of details, the final purchase of the Pratt & Whitney Company, of Hartford, by the Niles-Bement-Pond Company has been completed and that company is thus enabled to offer the lighter machine and small tools of its own make as well as heavier machine tools for which its previously acquired plants are more especially designed and adapted.

It is understood that the old stockholders of the Pratt & Whitney Company retain the preferred stock, amounting to $1,225,000 at par, while the Niles-Bement-Pond interests have acquired all the common stock, amounting at par value to $1,525,000.

The new officers of the Pratt & Whitney Company are as follows: Directors, R. C. McKinney, of New York; T. T. Gaff, of Cincinnati; F. W. Gordon, of Philadelphia; Amos Whitney, of Hartford; C. C. Cuyler, of New York; George W. M. Reed, of Hartford; W. L. Clark, of New York; C. L. Cornell, of New Jersey, and J. K. Cullen, of Hamilton, Ohio. The directors organized by electing Mr. McKinney president, Mr. Clark vice-president, and Mr. Cornell treasurer. The secretary of the new company is Francis C. Pratt. Mr. McKinney, as our readers know, is also president of the Niles-Bement-Pond Company.

It is no secret that internal dissensions have sadly handicapped the Pratt & Whitney Company for several years; indeed, the fact that this company has been able to maintain the position that it has maintained in the face of all the difficulties it has had to contend with is a splendid tribute to the ability of the men who founded it and to others who assisted them in giving the products of the shops their splendid world-wide reputation. From the machine-tool-engineering standpoint this company has been for many years in the forefront of the world's progress; but unfortunately the men who did most to put and keep it there have so far been very inadequately rewarded, considering the magnitude and far-reaching influence of the work they have done.

We shall hope that under the new business management which will now be inaugurated the magnificent mechanical abilities which can be brought to bear upon its work will have fuller scope, that in short the office and outside commercial work will be as well done as the mechanical and engineering work always has been. And if it is, then brighter days are in store for the Pratt & Whitney Company.

An Opportunity for Co-operation Between Engineering Societies.

The American Society of Mechanical Engineers has outgrown its house in New York city. At the recent annual meeting in New York, the attendance at every session was larger than the auditorium could accommodate. At the opening session, when the president's address was delivered, the whole house was filled and not half those present were able to find room in the auditorium. A committee, appointed some time ago, reported at the recent meeting, it is true, against taking any steps toward the provision of larger quarters for the society; but their report does not alter the fact that in one week of the year during which the society makes use of its house, it finds that building inadequate for its needs.

A little further uptown is the fine new

house of the American Society of Civil Engineers, completed three years ago and representing a total investment of about $250,000. The society uses it on two days in each year for its annual meeting, and on about twenty evenings during the year for its fortnightly meetings. Is there any good reason why this commodious building should not be made a general headquarters for engineering societies in New York city, or why the Mechanical Engineers should not obtain in that house the quarters they need? The time when sentiments of rivalry should prevail in either society—if indeed there was ever such a time—has now passed. Each society has its proper field of work; the field of either would be in no way circumscribed if the headquarters of the two societies were located in the same building and there need be no interference whatever between the two. As we have said above, each society holds its annual meeting in New York, but the date of one falls in December and that of the other in January. The Mechanical Engineers make no other use of their house for meetings during the whole year, save for the newly instituted Junior meetings, and these need not interfere at all with the regular meeting nights of the Civil Engineers.

We have said there are no reasons why the two societies should not co-operate in the use of a common New York headquarters. We would go farther, and say that there are positive and weighty reasons why they should do this.

Each of these two societies is now a highly prosperous organization. Each has a membership of above 2,000, and an annual income approximating $40,000. Some may claim, therefore, that there is no particular reason why these societies should economize. The Civil Engineers without doubt, can go on and finish paying for their house from their surplus income, and the Mechanical Engineers, in the course of time, can build and pay for a house of their own, large enough for all their needs.

But, because they can do this, does it follow that this course is the best one? We believe we voice the sentiments of the great bulk of the members of both societies when we say that the society funds should be put to such uses as will result in the largest benefit to the society's members; and that the needless multiplication of society houses in New York city to stand idle most of the year is not such a use.

The investment necessary for a suitable building for either society in New York city will approximate a quarter of a million dollars. The interest, depreciation, insurance, and taxes, added to the cost of heating, lighting, etc., will make the annual charge against such an investment not less probably than 10 per cent., or a total annual expense of some $25,000, as the cost of keeping up such a house in New York city. More than half the members of either society live too far from New York to make any use of the society's headquarters there. In fact, there was years ago considerable sentiment in each society against investment and expenditure on a New York house; and in the Civil Engineers this sentiment is till recognized in larger dues for the members residing in or near New York city.

The value to the society as a whole of permanent headquarters at what is unquestionably the engineering center of the country, is now well recognized; but the burden for this purpose on the membership at large ought to be made as light as possible. If by co-operation between the two societies in the use of the present house of the Civil Engineers a substantial sum could be saved annually to the treasury of each society, it seems to us the manifest duty of the respective governing bodies to bring this about.

And now for something else in the way of plain speech: It is too commonly said and felt by many members of each of these societies that the individual members have little voice or responsibility in the conduct of the society's affairs. The managing officers run the society, and the individual member pays his dues and receives in return his copy of the "Transactions" and whatever professional honor and personal satisfaction accrue from his membership.

With the rapid growth in membership of these two principal national engineering societies, the funds at the disposal of each governing body have largely increased, and will increase still more in the future. Should the members so desire, the way might easily be opened by the form of co-operation we have outlined, for a substantial reduction in the annual dues—and we know that to a large proportion of the members of both societies the annual dues are by no means an inconsiderable burden. If, however, the members prefer—and the members themselves and not the governing body should decide this question—this added income should be devoted to new purposes by which the societies can render still larger and greater service to their members.

There are fields and opportunities not a few where the society—the members acting together—can do for the profession and for each member of the profession what the members acting individually cannot do for themselves. One example of such work already undertaken by the Civil Engineers is the complete indexing of that society's library, the plans for making it available for non-resident members, and the plans for making it the complete repository of professional literature that it ought to be. Other work might easily be named, which the surplus funds, that would be placed in the societies' respective treasuries by the above-suggested co-operation would render possible; but to descibe such projects in detail would lead us too far afield.

We may say the same regarding other features of co-operation between the two societies, noting only that the suggested co-operation in the use of a common house might easily be the entering wedge for other forms of co-operation that should be mutually beneficial to the members of both societies.

The fact may not be generally known that a very considerable number of engineers already hold membership in both societies, and in this number are included many of the most prominent members of each. With this state of affairs, why should the governing body of either society hesitate to make the necessary advances toward co-operation?

The above we take from an editorial in the "Engineering News" of January 17, and we think most members of both societies will be disposed to say that it is freighted with good common sense and that in some such way as suggested the best interests of the membership at large of both societies will be conserved. We heartily endorse every word of it and hope that some action will be taken in the matter.

We would not favor a plan under which the American Society of Mechanical Engineers should dispose of its present inadequate house and become a tenant of the Civil Engineers' society; but if joint ownership could be arranged it would be a good thing, and the interests of both societies would be better served at less expense.

Examination for Sloyd Teacher.

The United States Civil Service Commission, Washington, D. C., announces that examinations will be held February 20 and 21, 1901, in any city having postal tree delivery, for the position of Sloyd teacher at the Phœnix School, Arizona, at $840 per annum and similar positions as they may be open. The subjects of the examination are spelling and copying, arithmetic, applied geometry, freehand drawing, industrial drawing, and especially practical questions relative to Sloyd work. Applicants should have a knowledge of wood carving.

Preference will be given to residents in the Indian service district where the vacancy exists. Persons desiring to compete should apply to the Commission for application form 304.

One result of the fire which occurred in the shops of the Lane & Bodley Company, Cincinnati, and which destroyed the foundry and all their patterns, is that the company will soon put upon the market what Mr. Lane calls a twentieth-century engine, drawings for which had been previously prepared. We are informed that the fire interfered very little with business, the foundry having been ahead of the other departments of the works and other foun-

dries in and near Cincinnati ready to make castings as needed, or as fast as patterns could be made.

"The Consolidations and Listed Stock Companies in the Iron and Allied Trades" is the title of a supplement to the "Iron Age" which has been published by the David Williams Company, of New York, and gives much interesting and useful information regarding the various consolidated companies commonly called trusts that have to do with the metal and metal-working trades.

In America engineers who make a specialty of water works are called "hydraulicians."—"The Engineer," London.

Our contemporary is right, the term being found in the vernacular of certain native tribes in Alaska and Paraguay.

Commercial Review.

NEW YORK, Saturday, Jan. 19.

MACHINISTS' SUPPLIES AND MACHINERY.

While there is nothing approaching a boom in the supply business a very fair volume of trade for this season of the year is moving. The supply business is kept in the background by stock-taking during the greater part of January. An increase is generally noticed about the beginning of February with a gradual improvement reaching its maximum in March or April. A growing demand is therefore to be looked for in the near future, and if the tone of tradesmen is taken as a criterion it will not fail. Some seem to be looking for a better year than last. Last year surpassed the one before it in some cases, and would probably be found to have done so in very many if the truth were all known. But conjectures of the future are not requisite to sustain courage, for January's trade is quite what it ought to be. The prevailing steadiness of prices shows that manufacturers are not having to resort to unpleasant expedients in order to keep their works going. In some quarters extremely sanguine opinions are held. A man connected with the carpenters' tool business who was in town lately predicts that if buyers do not place larger orders than at present they will soon find themselves in a position where they cannot get what they want, as has happened in the last year or so. One of the local dealers reports optimistic views prevalent among people whom he encountered at the bicycle show in town. They were men representing industries connected with the metal trades and who came from divergent directions—Canada, up-State and the South.

The closing measures of the long-drawn out purchase by Niles-Bement-Pond interests of control in the Pratt & Whitney Company are among the matters most worthy of note in the Eastern tool market at present. Some comment thereupon, with a list of the newly-elected officers and directors of the Pratt & Whitney Company will be found elsewhere in this paper.

Charles Churchill, who has just returned to England after a visit to this country, made a statement which tends to quiet the suspicion that the English tool market is going back on us like the German. Mr. Churchill's house has plenty of orders and is as busy as it can be. In fact, its trade has been showing a steady increase for years, except at the time of the bicycle manufacturing boom, when the ascending line took on a decided hump.

The firm is planning to participate in an enterprising way in the coming Glasgow exhibition. They propose to put up an independent pavilion, 60x20 feet, finished off in masonry to conform with the other buildings of the show. It will be equipped with motors, shafting, etc., so that the tools of the firms they represent may be shown in motion upon occasion. The firm has addressed invitations to participate and contribute to thirteen American machinery manufacturers, and in nearly every case the proposition has been met with favorably. Among these are Warner & Swasey, the Cleveland Machine Screw Company, Cincinnati Milling Machine Company, and the Brown & Sharpe Manufacturing Company, the last named in the lines of grinders and gear cutters.

Bids will be opened, January 29, for the following machine tools, etc., for the Boston Navy Yard: One 26-inch by 24-foot back-geared engine lathe, 24-inch back-geared engine lathe, 20-inch by 12-foot gap lathe, six 16-inch back-geared engine lathes, 2-inch by 24-inch screw threading turret lathe, duplex milling machine, 20-inch by 18-inch universal milling machine, 23-inch by 17½-inch universal milling machine, 33 by 19 inch universal milling machine, 48-inch by 19-inch plain milling machine, 24-inch pillar shaper, 20-inch pillar shaper, 15-inch pillar shaper, 18-inch surface grinding machine, 20-inch by 8-foot universal grinding machine, vertical six-spindle turret lathe, 65-inch universal radial drill, two 12-inch sensitive drills, electrically driven; 51-inch boring and turning mill, 60-inch automatic gear cutting machine, 48-inch by 16-foot planer, 2½ by 19-inch key seating machine, two speed controllers, metal separator, magnetic; scroll sawing machine, hand shear, double angle shears, 2½-in. heading, upsetting and forging machine; cold saw cutting-off machine, 4,000-pound single standard steam hammer, locomotive crane of 10 tons capacity, two platform scales with wheels, capacity 2,000 pounds; hydraulic manhole punching machine.

One of the newest claimants for a share in the steel-car boom is the National Rolled Steel Car Company. It is stated that this company has been incorporated under the laws of West Virginia with a paid-up capital of $600,000, which will be increased to several millions. Plans have been completed for a plant to cost between $1,500,000 and $2,000,000, to be located in the Pittsburgh district. Rolled steel railroad box cars, gondolas and car trucks will be manufactured under patents owned by C. M. Carnahan. The company will own and operate coal mines, ore mines and limestone properties, and when completed will employ 2,500 men. Temporary shops have been located at Hazlewood, where first orders are now being filled. The company is being financed largely by Pittsburgh capital and general offices will be opened there April 1. Work on the new plant will begin at once.

The construction of the new works of the Grant Tool Company, Franklin, Pa., is progressing finely, but has been at a standstill until now for the want of structural steel for the various buildings.

The Bethlehem Steel Company informs us that a concern styling itself the Edison-Holzer Steel and Iron Process Company has been using its name in a letter asking for stock subscriptions. The Bethlehem Company states that it has no connection with the Edison-Holzer Steel and Iron Process Company, nor in any way endorses the merits claimed by them for their process for treating steel.

The Dodge Manufacturing Company is executing for the Pennsylvania Railroad a contract for rope drives of the Dodge continuous system to be installed at its meadow shops, Jersey City, where the motive-power arrangements are being overhauled. These are a 200 horse-power and a 170 horse-power engine drive and a 75 horse-power drive for connecting two jack shafts. There are also being furnished new flywheels and an outfit of jack shafts, beside quills, friction clutches, etc. Four rope drives were started up last month in the glove-leather works of Booth & Co., Gloversville, N. Y.

CHICAGO MACHINERY MARKET.

One large maker of machine tools has sold in the Chicago market during the first two weeks of January more tools than during the average month of 1900, which he says is a gratifying opening of the new year. His trade last year was the best ever experienced here. All reports are not so favorable as the above, but generally speaking, the year opens with a reasonably fair amount of business. The markets of large machine tools do better than the makers of the smaller machines and dealers who handle all kinds say the demand is mainly for the larger ones.

Among other reasons which might be offered by way of explanation for this condition is this, that the market is flooded with an unusually large number of second-hand small machines. They come largely from the numerous bicycle factories that are being dismantled. Four or five years ago the bicycle trade was a most important element in the machine-tool trade, giving to it the main source of vitality. Now, like bread cast upon the

waters, these tools are returning, some think, several fold. At least it seems that way. The process of absorption has been going on for some time past, but the supreme effort to market the surplus machinery has lately been made, with perceptible effects upon some branches of the trade. Twenty factories have been dismantled and a large array of machines placed with dealers for disposition.

In conjunction with this condition of abundance, the factories are said to be in better shape to answer to current demands, and these two facts combined tend to give the market the appearance of a nearer approach to stillness than has actually been traveled from the lately occupied field of activity. In volume the aggregate current trade is good.

Encouraging reports are heard concerning the machine shops of Chicago. The prospects all point to a year of steady operations. It is true that the greater activity prevails among those shops manufacturing specialties and that some of the general jobbing shops are not so well loaded with orders as they desire, but the changes are in the direction of improvement. The orders from these shops are usually for only one or two machines, for work is not so rushing as to make large accessions to equipment immediately requisite. This applies to the smaller machines. Large plants are relatively the busier and are pertinacious in the matter of buying the latest and best machines.

Further inklings are heard about the present activity of furniture makers, and calls for woodworking machines are coming quite largely from the South, where apparently a large number of furniture shops are going into business.

The Marshall & Huschart Machinery Company, Chicago, informs us that the contemplated combination with J. B. Doan & Co. has been called off, owing to differences arising between them and the former company. The business of the Marshall & Huschart Machinery Company will therefore be continued as heretofore, with the addition of Allan Ransom, long of their selling force, who has purchased an interest in the concern. The capital stock has been increased from $50,000 to $100,000, and the officers are: Alfred Marshall, president and general manager; Allan Ransom, vice-president; Frank M. Huschart, secretary and treasurer. The Cleveland store is now in full running order, a complete stock of machines having been supplied to it.

CINCINNATI REPORT.

In a general way the optimistic feeling that prevailed among the larger manufacturers of machine tools and allied lines prior to the holidays, anticipating the new year, is still on. Your correspondent has talked with half a dozen of the representative manuacturers of Cincinnati—representative in both the matter of importance in size and character of plant and in a commercial standing way—and these gentlemen feel that there is a slow but steady increase in inquiry and demand for the higher and special grades of machinery. No particular section may be cited, unless it be the East.

A number of local concerns have shipped lathes, drills, milling machines, engines and dynamos to that section, and the character of contracts suggests a general tendency to increase the size and character of already important plants.

The Lane & Bodley Company, which suffered the loss of several buildings by fire a few weeks ago, has just received an order from Seattle for a 36x42 Corliss engine, to be attached to a 650-kilowatt General Electric dynamo on shaft. The installation is for a municipal lighting plant. The size, for a simple engine, is somewhat unusual, engines being generally of the compound type when built as large as this one.

There is a feeling among local manufacturers of engines and allied machinery that February and March should be prolific of orders. Ground is usually broken for machinery operations during these months, and orders of any consequence are rarely expected sooner. The boiler manufacturers also find considerable in the early year's trade atmosphere to suggest sentiments of satisfaction.

The Tudor Boiler Company is well begun on the extensive remodeling which is to see the installation of a number of electric cranes and other appliances, and while not aggressively seeking new business, finds the improvement of a slow but steady growth. The company has just put on the market the Babcock & Wilson type of boiler on the models of which it has been working for the past eight months. The representative boiler-making concerns all unite in the belief that the market is in a very healthy condition and note less trouble and inconvenience in obtaining material, which is gratifying in that they are able to make deliveries when promised. Where one year ago it required three or four months to get the steel, practically all orders of any consequence are now filled within two. The demand is generally for a higher pressure grade of goods.

The R. K. Le Blond Machine Tool Company reports that domestic inquiries have lately been coming in in great volume. This company has just sold to the Brown Hoisting Machinery Company, of Cleveland, a number of large lathes.

E. H. Hargrave, of the Cincinnati Tool Company, who has been feeling the foreign trade pulse for the past year or so believes that foreign business is going to greatly improve this year, perhaps make its greatest record with all reputable manufacturing concerns of this country.

The Cincinnati Tool Company has recently removed its plant to Waverly avenue, Norwood, and has increased its floor capacity about ten thousand square feet within a year. The Norwood manufacturing colony, which embraces, in addition to the Cincinnati Tool Company, the great plants of the Globe Wernicke Company, the United States Card Playing Company and the Bullock Electric Company, has entertained many visitors during the past week. A number of new principles in the application of electric and conveying machinery are in demonstration in one or another of these plants and critical inspection is therefore of frequent occurrence.

An order has just been received by the Cincinnati Milling Machine Company which calls for a quantity of cutter grinders for a prominent concern in France. Julius Fischer, managing director of the German Garvin Machine Company, of Berlin, is a visitor in Cincinnati.

Quotations.

NEW YORK, Monday, Jan. 21.

Iron—American Pig, tidewater delivery:—

Pennsylvania Irons:

No. 1 X foundry	$16 25 @ $17 00
No. 2 X foundry	15 50 @ 16 00
No. 2 plain	14 50 @ 15 25

Alabama Irons:

No. 1 foundry, or soft	15 25 @ 15 75
No. 2 foundry, or soft	14 50 @ 15 00
No. 3 foundry	13 75 @ 14 25
Foundry forge, or No. 4	13 25 @ 13 75

Bar Iron—Base sizes—Good standard brands from store, 1.75 @ 1.90c.; mill prices on dock, 1.50 @ 1.60c.

Tool Steel—Base sizes—Good standard quality, 7 @ 8c.; extra grades, 10 @ 14c.; special grades, 16c. upward.

Machinery Steel—Base sizes—From store, 1.70 @ 1.80c.

Cold Rolled Steel Shafting—Base sizes—From store, 2.50 @ 2.75c.

Copper—Lake Superior ingot, in carloads, 16⅞ @ 17c.; electrolytic, 16⅝c.; casting, 16½ @ 16⅝c.

Pig Tin—26¾ @ 27c., for 5 and 10-ton lots, f. o. b.

Lead—For wholesale lots, 4⅜c., with .02½c. extra for carloads.

Spelter—4.10 @ 4.15c., New York.

Antimony—For 5-cask quantities Cookson's is about 10½ @ 10⅝c.; Hallett's, 9c., U. S., 9.10c., and Japanese, 8¾c.

A warning is sent from London to American agents who go to Europe for the first time to work up trade: "Keep shy of the seemingly prosperous gentlemen at the big hotels in London and on the Continent who are always so glad to welcome a fellow countryman. These men usually pump the new arrival for information about his plans, which can be turned to cash value with rival local concerns." It is also stated that many an American agent who has accepted a proffered introduction to business houses without a hint of any other motive except friendliness has been compelled to pay a stiff commission afterward.

Some Large Portable Tools.

We show herewith illustrations of some portable tools for use on extended floor plates which are, we believe, the largest yet made. They show the development of the floor-plate system of doing work in the size of the tools used.

Fig. 1 shows a slotting machine, of the size of which an excellent idea may be obtained by comparison with the man alongside. The machine is driven by an electric motor which is encased in the column. The method of driving the ram by a screw is apparent from the picture, the screw being of 5 inches diameter. The machine has a stroke of 8 feet and a cross feed of 4 feet. A sub-base is provided on which the column may be moved through an additional 4 feet, and by using this in conjunction with the cross feed on the ram, a face 8 feet wide may be surfaced.

A special feature of this machine is a safety clutch in the driving gear, seen just above the large gear on the long screw. The machine being belt driven, failure of the shipper or the unlacing of a belt would cause the ram to over-run, and, if working near the limit of its stroke, it might run into the ends of the column and do damage. Should the screw thread be cut off at the ends to prevent this, the result would be to pound and injure the threads. The clutch above described is so arranged that over-run of the ram will open it—on the up stroke through the short rod hanging from the clutch lever, and on the down stroke through the long rod in the man's hand. The belt-shipper rod is alongside the safety rod—the stop-collars upon it being just visible. The weight of the machine is about 50,000 pounds.

Fig. 2 is a portable boring and milling machine, also of large size. The entire operating mechanism, motor included, will be seen to be mounted on the spindle head. The vertical range of movement of the head on the column is 8 feet, and the horizontal movement of the upright on the base is 7 feet. The boring bar is 5½ inches in diameter and has a feed of 50 inches. Boring and milling feeds and speeds are provided. The gross weight is 19,500 pounds.

The machines are the product of the Newton Machine Tool Works, who have just supplied two of each to the Westinghouse Electric Company. They were ordered for use in making the mammoth generators now under construction for the

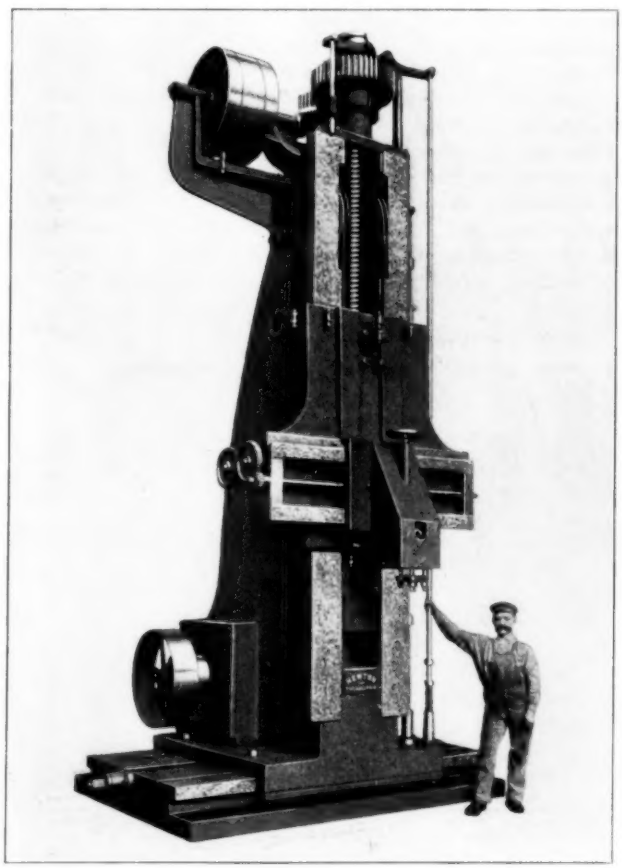


FIG. 1. A LARGE PORTABLE SLOTTER.

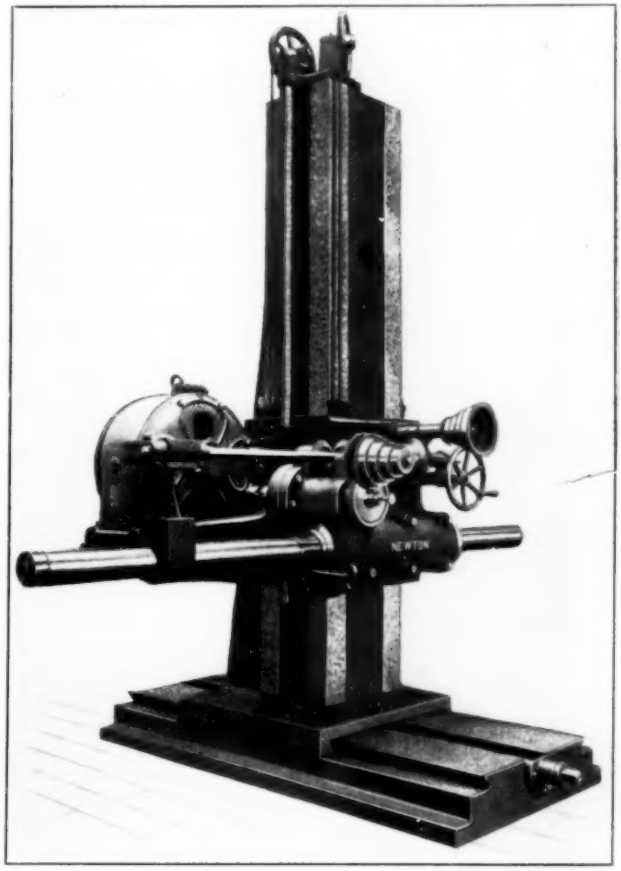


FIG. 2. A LARGE PORTABLE BORING AND MILLING MACHINE.

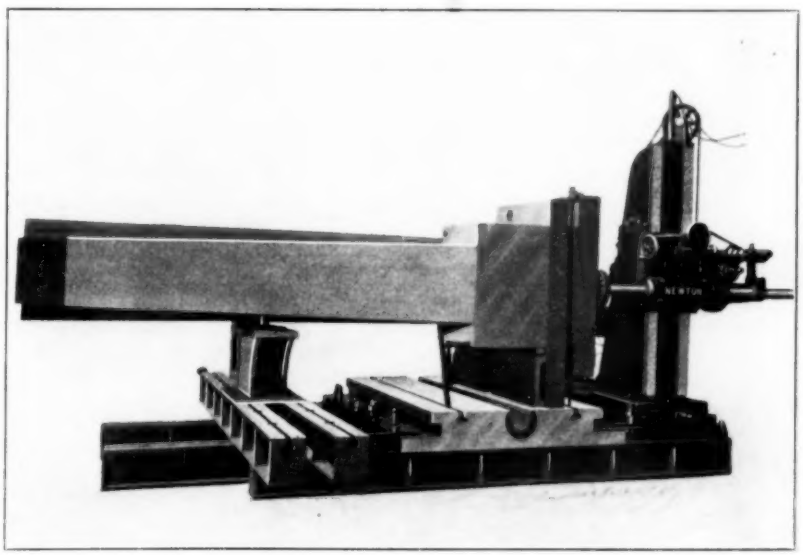


FIG. 3. SHOWING THE USEFULNESS OF THE PORTABLE BORING AND MILLING MACHINE.

electrical equipment of the elevated railroads of this city.

Fig. 3 is a good illustration of the usefulness of floor plates and portable machines of the type shown in Fig. 2, though the machine shown in Fig. 3 is of much smaller size than the one shown in Fig. 2. A floor plate is being put down in the Newton works, but it was not ready when the job shown in Fig. 3 came along. The whole rig is therefore extemporized, and consists of several cast-iron beams from the future floor plate, with the base of one of the slotting machines shown in Fig. 1. On these is laid the column of one of the slotting machines, and the portable boring and milling machine is at work surfacing the bottom of the column.

Logarithmic Table of Board Measure.

BY W. H. SARGENT.

The accompanying chart, Fig. 1, shows a ready means of computing the amount of lumber in a stick of a given size and length. The more common sizes are shown up to 12x12 inches; larger sizes can easily be found by doubling some smaller size; 12x18 being, of course, twice the size of 9x12.

The figures on an angle represent the sizes of timbers, the numbers across the top indicate the length in feet, and those down the sides are the amounts in board measure.

The method of using the chart is shown in Fig. 2. Suppose we wish to find the amount of lumber in a stick 6x8 inches square and 50 feet long. Find the size 6x8 at the bottom of the chart and follow this diagonal line upward until it crosses the perpendicular line, 50, representing length. The horizontal line nearest to this point of intersection (in this case 200) will indicate the total amount of board measure in feet.

If, however, we wish the contents of a stick 6x8 inches and 20 feet long, we find that the diagonal line marked "6x8" at the bottom of the chart does not intersect the perpendicular line 20. In this case use the *dotted* diagonal marked "6x8" on the *left-hand side,* the reading being performed as indicated in Fig. 3; the answer being 80 feet. It will be noticed that wherever one diagonal line leaves off at the top the companion line begins at the bottom, so that all sizes and dimensions are fully covered by the chart. For sticks under 10 feet long, read 2, 3, 4, etc., instead of 20, 30, 40, remembering to drop off a cipher from the final result as well. The method of plotting the diagonal lines may be of interest to those who wish to compute other sizes of timber than those shown. A 6x8 stick contains 48 inches, or 4 feet, board measure for each foot in length. The diagonal line representing this size would then start from the bottom of the chart and run up at an angle of 45 degrees to "4" on the right-hand side. (In Fig. 1 this "4" is marked "400," so as

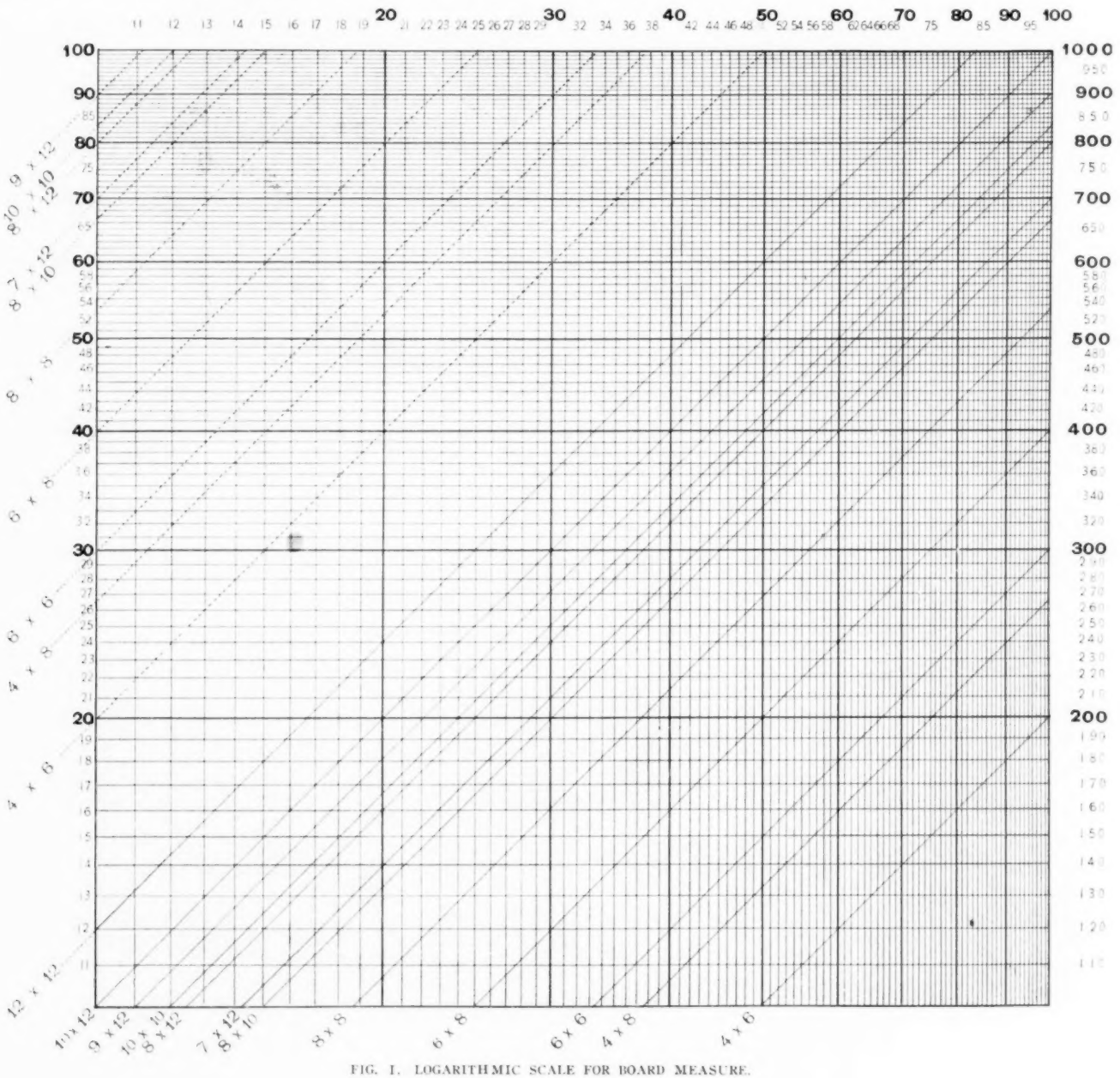


FIG. 1. LOGARITHMIC SCALE FOR BOARD MEASURE.

to facilitate computations.) The 8x8 stick containing 5⅓ feet to each running foot would likewise be indicated by a line running to "5⅓" on the chart.

This explains *how* but not *why*, since the latter question was answered at some length in Nos. 25 and 26 of the "American Machinist" for 1900.

This chart will be found handy for mill-

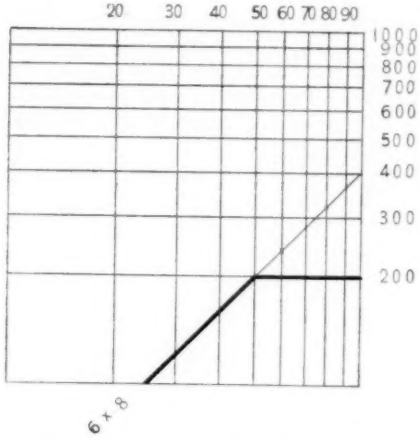


FIG. 2. SCALE FOR BOARD MEASURE.

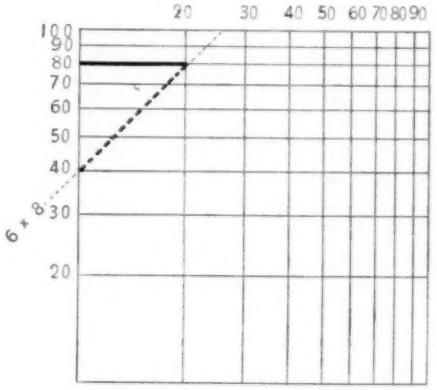


FIG. 3. SCALE FOR BOARD MEASURE.

wrights, engineers and mechanics in general, since it not only saves the drudgery of figuring each stick every time, but also avoids the liability to error resulting from the use of so many figures.

Blueprints.

Those who, with the best of intentions, send us tracings of mechanical drawings will doubtless be glad to know that blueprints are really preferable. They are more easily handled; they may be cut apart or marked on, as we may have occasion, and if they are lost or destroyed they may be easily replaced. So please send us lots of blueprints, rolled or folded, as most convenient. It makes no difference to what scale they are drawn. Good bold shade lines are always in order, and little shading is desired beyond that. These matters, however, we can correct, if the drawing is clearly understandable and gives all necessary details. The less that is shown beyond that the better. Good shop drawings are always good for our pages and for the readers of the pages.

Dividing the Shop Burden in Cost-Accounting at the Works of William Sellers & Co.

It may be remembered that in an article on "Cost-Keeping," published in our issue No. 45, of last year, we remarked upon the unsatisfactory nature of both the percentage and the hourly plans of distributing the gross shop burden among the different pieces of work turned out. The most unsatisfactory feature of both plans is that they make no provision for charging against a piece of work the interest and depreciation belonging to the tool on which the work was done. Both plans add the gross interest and depreciation to the other items of shop expense and then charge the total amount against the work on a flat rate or average basis which ignores the individual tools. On small and medium-size tools the interest and depreciation item is of small importance, but on large ones it is the most important of any, and, indeed, on very large ones more important than all the others added together.

With the percentage plan the gross burden for a given period is divided by the *gross direct wages* for the same period, to obtain a percentage by which to increase the direct wages on any job in order to find its gross cost. With the hourly plan the gross burden for a given period is divided by the *total number of hours* worked by direct labor during the same period to obtain the charge per hour which must be added to the wages for each hour of direct labor spent on a job in order to obtain the gross cost.

Neither plan makes any distinction between small and large tools. If two men receive the same wages, one of them operating a small lathe and the other a large boring mill, the burden charged for an hour's work by either plan would be the same for the lathe as for the boring mill. This leveling or averaging process of dividing the burden must necessarily result in an overcharge on small work and an undercharge on large work.

In the article referred to, we remarked upon this common shortcoming of the two plans, and expressed the opinion that a really satisfactory system of cost-accounting must include a series of graded charges for tools of different values. Such a contention is not a case of hair-splitting. On the contrary, very limited examination of the matter will show that tools do not become very large before the proper burden chargeable against them exceeds the wages of the operator, and when this condition is to be met, the correct charging of the burden against individual jobs becomes of more importance than the correct charging of the wages against them. We are convinced that in shops having many large tools, cost-accounting on a plan which would ignore the difference in the wages paid to different men but which would charge a flat average rate of wages per hour for all work done, would introduce smaller errors than do these plans which divide the burden by averaging it among the tools regardless of their cost. To shops containing no large tools this does not apply. The presence of large tools in a shop is the most disturbing of all factors in cost-accounting. Where such tools do not exist, the necessity for graded tool charges does not exist, and the usual methods of distributing the burden in such shops are, from this point of view, satisfactory.

The article above referred to has brought to our attention the method of dividing the burden which is used at the works of William Sellers & Co. This method recognizes the importance of the interest and depreciation item on large tools, and charges this item in accordance with the value of the tool on which the work is done. It is significant, moreover, that the method has been in use for over thirty years, which is but one illustration of the manner in which William Sellers & Co. have faced and solved some mechanical problems before the mechanical public at large learned that they needed solving at all.

Under this system two charges are added to the wages of the operator—one to cover all items of expense except those chargeable to the tool proper, and the other to cover the expense of maintaining and operating the tool. The first charge is added as a percentage of the workman's wages, while the second is added as a charge per hour, and varies with the value of the tool used. In the case of a vise or floor hand, the second addition to his wages would not be made, since such a workman does not use what William Sellers & Co. aptly call power tools.

Contrary, perhaps, to the general impression, the leading value of a correct system of cost-accounting in any business which manufactures a line of staple goods for sale from the warehouse, is not that of determining prices. Prices at any moment are determined by the state of the market. Increased cost through any cause except, for instance, a general increase in the cost of material or labor, which affects all manufacturers, is not reflected in the prices obtained, nor does high cost in any establishment enable that establishment to obtain better prices than its competitors. As modern business methods have developed, the carrying of large stocks of goods is increasingly necessary. These goods form a leading item in the annual inventory, and on their correct valuation in that inventory the accuracy of the annual balance-sheet depends, and in this is wrapped up the entire financial standing of the business. In such a business this determination of inventory values of the goods on hand on inventory day is the leading object of cost-accounting.

One of the satisfactory features of both the flat percentage and hourly plans of distributing the burden is that we really charge up the total burden against the

total production. If, for example, the entire year's production was present in the warehouse at the end of the year, we may feel sure that with either plan, while the calculated cost of the small work would be too high and that of the large too low, the total would be correct. With the hourly plan, for example, the gross burden is divided by the total of the direct hours of labor to get the burden per hour. If now the resulting hourly burden is multiplied by the hours spent on each job, since the total of these hours is the same total as that used in finding the hourly burden, the gross burden charged must be the same as that with which we started to find the hourly rate.

This feature is of fundamental importance, and one of the difficulties which crops up in any attempt to grade the charges in accordance with the value of the tools by which the work is done is to preserve it. The leading feature of this system of Wm. Sellers & Co., to our mind at least, is that it does preserve this feature, and it is the only system of graded tool charges that we have ever seen which does preserve it.

The item charged against the tools is obtained by dividing the total charge in such manner that when the quotient is again multiplied by the value of and the hours worked by the separate tools, the original total will be again reproduced, and the total valuation of a year's production will be the true total cost, as with the hourly and percentage plans, but with a higher valuation of the large, and a lower valuation of the small work.

Most of the calculations detailed below are for the purpose of obtaining the total to be charged against the tools, and as these calculations are somewhat extended they may, without this explanation of their real purpose, obscure that purpose. After this total is obtained, the method of dividing it is simple and plain, and to avoid the chance of this milk in the cocoanut being lost sight of, we give here by itself a statement of the method of division. It is quite possible that others may feel that a simpler method of obtaining the total would be satisfactory. For example, the principal factor which makes such a division desirable being the interest and depreciation, our own idea would be that if this gross sum, which is easily determined directly from the ledger, were thus divided it would give with substantial accuracy the results desired, and if this sum were thus subtracted from the gross burden it would give the total burden to be charged against wages. The leading error of this method of division would be that it would charge the cost of power against fitting labor as well as against power tool labor. The cost of power in a machine shop is, however, a small item at most, and such an error would not be of much moment.

The method involves the keeping of the tool time as well as the workmen's time. This is taken by having the workman enter on his regular time ticket, in a place provided for it, the number of the tool which he operated. The sum of the hours worked by all tools for the year thus obtained forms one basis of the division, and the total inventory value of all the tools forms another. Both of these sums are perfectly definite and are matters of record.

Dividing the total burden against the tools by the total number of hours worked by all tools will give the average charge per hour per tool, thus:

$$\frac{\text{Total burden}}{\text{Total hours worked}} = \text{average charge per hour per tool.}$$

This charge will, however, be too large for the small tools and too small for the large ones. The next operation, therefore, reduces this average charge to a charge per hour per dollar of value, thus:

$$\text{Average charge} \times \frac{\text{number of tools}}{\text{total value of all tools}} = \text{charge per dollar per hour.}$$

By multiplying this dollar-hour charge by the value of any tool, the charge per hour for that tool is obtained. In point of fact, however, the burden per hour is not calculated separately for every tool. The tools naturally form groups of approximately the same value, and a list of tools thus grouped is kept. The charge made for all tools in a group is the same, and is the average of the charges for the individual tools of the group, this charge being entered as a memorandum against each group. In a works of the size of that of William Sellers & Co. a group may contain fifteen or twenty tools, except among the large ones. As the tools increase in value the groups naturally become smaller, a few of the largest being treated individually.

The percentage charge for the wages burden and the hourly charges for the various tools being thus determined, the calculation of the cost of any piece of work consists of adding together the actual wages on the work, the percentage of the wages forming the wages burden, and the charge per hour forming the tool burden. In the case of fitters and floor workmen the tool charge is of course omitted.

The actual calculation of the gross tool burden as carried out by William Sellers & Co. may be exhibited in a series of steps, thus:

(1) Let a = gross shop burden,
b = gross repairs, depreciation and other special expenses on power tools;
then $a - b = c$ = gross burden, less special tool expenses.

(2) Divide c into two parts, d and e, proportioned to the power tool and the fitting inventories respectively, giving:
d = total burden on fitting labor,
e = total burden on power-tool labor, less b.

(3) To e add b, giving:
$b + e = f$ = total burden on power tools and power-tool labor.

(4) Divide all labor into two classes, giving:
g = total hours of fitting labor,
h = total hours of machine-tool labor.

(5) Divide d by g, giving:
$\frac{d}{g} = i$ = burden per hour on fitting labor.

(6) Multiply total hours on power tools h by rate per hour of fitters' burden i, giving:
$h \times i = j$ = total burden on power-tool labor.
Subtract this total power-tool labor burden from the total burden on power tools and power-tool labor, giving:
$f - j = k$ = net power-tool burden.

(7) Let l = total value of tools;
then $\frac{h}{\text{number of tools}} =$
m = hours worked by each machine tool,
and $\frac{k}{l \times m} = n$ = burden per dollar per hour.

(8) $n \times$ value of each tool = burden per hour for that tool.

(9) $\frac{d+j}{\text{total wages}} = o$ = burden per dollar of wages.

Leading Features of the De Laval Steam Turbine.*

BY FRANCIS HODGKINSON.

After a historical sketch relating chiefly to Hero's reaction steam turbine, the author continued:

Before leaving this brief historical review, it is interesting to record that Mr. Parsons, with a view of exploring the possibilities of a reaction steam turbine, constructed one on the lines of Hero's engine. The sphere was replaced by two hollow oval sectional arms, mounted upon a hollow shaft, with jets at the outer ends, through which the steam issued tangentially to the plane of motion. The whole was enclosed within a cast-iron case and connected to a condenser.

With 100 pounds steam pressure per square inch at the jets and 26 inches vacuum in the exhaust casing, a speed of 5,000 revolutions per minute was attained and 20 horse-power developed. The consumption of steam was 40 pounds per brake horse-power.

It is not a little remarkable that the latest development of steam engineering should be a return to the earliest form of engines of which we have record. It is still more remarkable that the engine, as described by Hero, had greater possibilities of economy than any steam engine produced for eighteen or even twenty centuries later.

The fundamental principle of the steam

* Extracted from a paper read before the Engineers Society of Western Pennsylvania.

turbine in contradistinction to the reciprocating steam engine lies in the fact that the latter does work by reason of the static expansive force of the steam acting behind a piston, while in the former case the work is developed by the kinetic energy of particles of steam, which are given a high velocity by reason of the escape of the steam. The unique features of this turbine are the nozzle and the means by which the wheel is enabled to revolve upon its axis of gravity.

With regard to this latter point, a difficulty always arises in attempting to revolve a body at a high rotative speed. It is essential, in the first place, that the

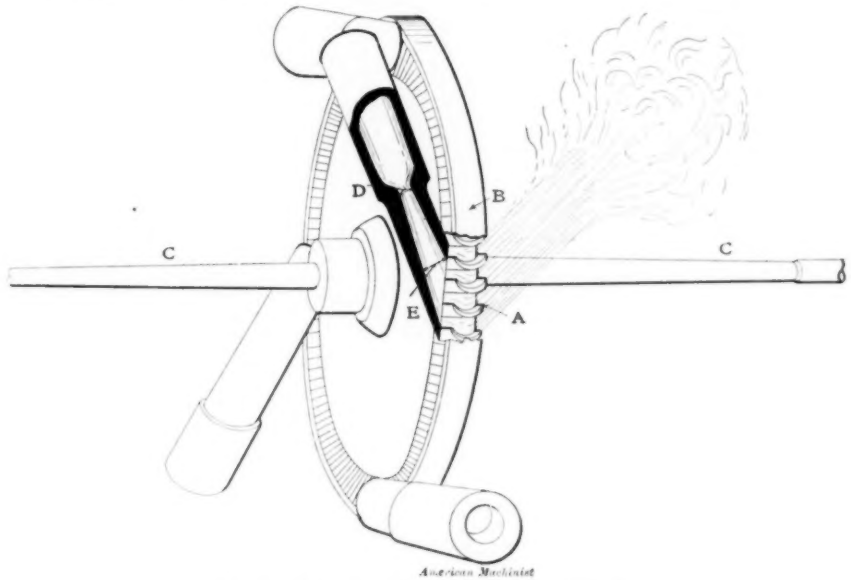


FIG. 1. SKETCH OF THE DE LAVAL TURBINE.

steam expanding from one pressure to a lower.

The general principles made use of in water turbines apply also to steam turbines. The buckets and guides must have as little skin friction as possible, and be so arranged that the acting fluid may strike without sudden shock, and have its direction of motion changed without sharp angular deflections. One difficulty, however, presents itself, due to the tremendous velocity of steam as compared with that of water under ordinary heads.

The laws governing the best velocity of buckets are the same as for water-wheels. In the impact turbine the ideal condition is when the peripheral velocity of the buckets is one-half that of the fluid comprising the jet. In the reaction turbine this velocity must be equal to that of the jet in order to give us this ideal condition. Now with high-pressure steam discharging into a vacuum through a divergent nozle, the velocities obtained are from 3,000 to 5,000 feet per second, as calculated by Zeuner's formula.

A turbine, therefore, built on the lines just enumerated would have peripheral velocities far beyond the limits imposed by the strength of the material. As an example, a 10-inch Hero's engine would revolve at 75,000 revolutions per minute.

The De Laval turbine, shown in Fig. 1, consists of a divergent nozzle which directs the jet of steam upon suitably formed buckets *A*, which are attached to the periphery of a revolving wheel. The outer edge of the buckets is shrouded by a steel ring *B*, which prevents the centrifugal

body be accurately balanced, but in spite of all care this cannot be attained with absolute accuracy. The result is that with ordinary shaft and bearings, tremendous vibrations would be set up that would probably result in eventual rupture of the shaft. De Laval overcomes this difficulty, however, by mounting his wheel near the center of a long light shaft *C*, capable of being considerably bent and returning to its original form. The shaft is mounted upon bearings of ordinary construction. This flexibility enables the forces set up by the revolving wheel to deflect the shaft and enable the former to revolve about its axis of gravity.

The nozzle is divergent. In it the whole expansion of the steam is carried out. The steam at the mouth of the nozzle has the same pressure as the exhaust. In other words, the steam has its energy completely transformed into mass and velocity by the time it comes in contact with the buckets.

This brings up another feature of the turbine which is, that with the exception of the nozzles, and the throats of the nozzles, no parts are subjected to steam pressure. It is well known that the velocity of steam flowing through an orifice, from a greater to a lesser pressure, increases as the difference of the pressure increases, only up to a certain limit. This limit is reached when the lower pressure becomes less than 56-100ths of the higher. Beyond this, however much the steam pressure is increased, the velocity of steam remains practically the same—about 1,476 feet per second. This limit of velocity is an anomaly, which seems never to have been satisfactorily explained. It is probably due to the fact that the pressure in the center of the throat is not the same as in the surrounding medium. The jet, after passing the throat, suddenly expands and the change of direction of the fluid particles gives rise to centrifugal forces. Experiments all show that in a jet, discharging from a reservoir of high pressure into a lower pressure, where the ratio is greater than 56 : 100, the pressure in the throat of the nozzle is always equal to 56-100 of the absolute pressure of the reservoir, no matter how great may be the difference between the two pressures.

With small differences of pressure, such that the lower pressure is greater than

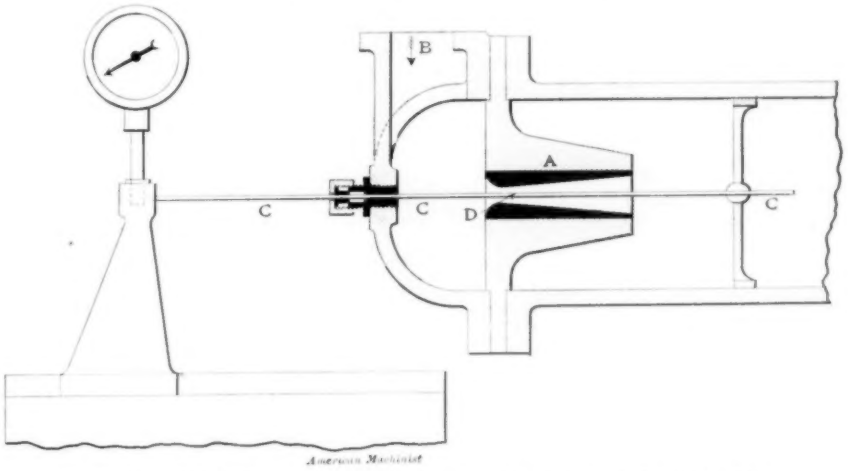


FIG. 2. APPARATUS FOR INVESTIGATING THE ACTION OF STEAM NOZZLES.

.56 × the higher pressure, the fluid will issue with a velocity varying with the square root of the ideal head, which will increase as the differences of pressures increase, until we reach the before mentioned condition of maximum discharge, and up to this point the steam will issue from the nozzle in substantially straight lines; this of course providing the nozzle has a well-rounded entrance, and is not in the condition termed "an orifice in a thin plate."

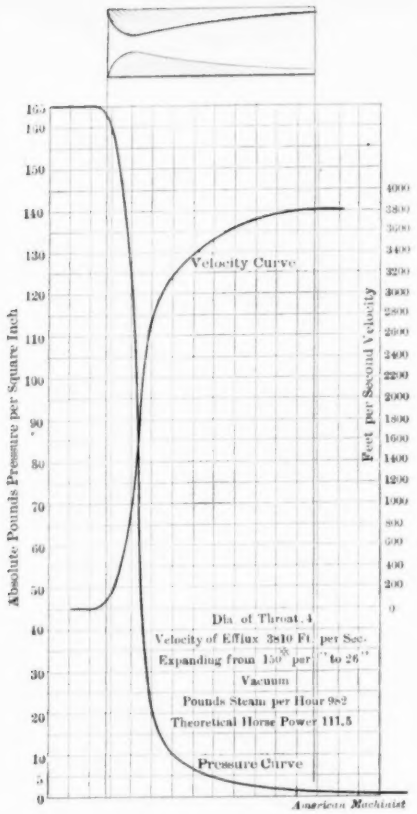

Absolute Pounds Pressure per Square Inch
Feet per Second Velocity
Velocity Curve
Dia. of Throat .4
Velocity of Efflux 3810 Ft. per Sec.
Expanding from 150 lbs. per " to 26 "
Vacuum
Pounds Steam per Hour 982
Theoretical Horse Power 111.5
Pressure Curve
American Machinist

FIG. 3. THEORETICAL CURVES OF PRESSURE AND VELOCITY OF STEAM FLOWING THROUGH AN ORIFICE.

When the pressure is increased beyond this, the system expands partially outside the nozzle, and the particles cease to issue in a straight line as before. This subsequent expansion is taken advantage of by De Laval by means of his divergent nozzle, which is of the form shown in Fig. 1.

The throat is at D, having a well-rounded entrance, and from there on the nozzle diverges. The relation of the area of the outlet at E to the area of the throat at D should satisfy the equation:

$$\frac{Fm \times Wm}{Vm} = \frac{F2 \times W2}{V2}$$

Fm = sectional area of the throat.
$F2$ = sectional area of the outlet.
Wm = velocity of steam at throat.
$W2$ = velocity of steam at outlet.
Vm = specific volume of steam at inlet.
$V2$ = specific volume of steam at outlet.

This equation simply states that equal weights of steam pass at both the throat and the outlet in equal intervals of time.

Practically, a nozzle must be made with the area at the exhaust end as small as possible, for the sake of getting the greatest velocity, but just so large that the pressure will not be higher than that of the exhaust pipe.

The best length of nozzle is hard to determine. If too long there will be considerable loss of velocity due to skin friction. At the same time it must be long enough to admit of proper expansion of the steam. The best shape of the divergency has been the subject of investigation by various experimenters, in order to give the best expansion curve. The writer's opinion is that the best results in this respect are obtained from a nozzle whose section is very near an ellipse.

The investigation of the performance of steam nozzles is particularly interesting. The apparatus usually employed is shown in Fig. 2.

The nozzle for the experiment is at A. The steam entering at B discharges through the nozzle directly into the exhaust pipe. At C is provided a small searching tube, sealed at one end and with a minute hole D some distance from this end. At the other end is provided a suitable pressure gage or mercury column. Means are provided for sliding the searching tube with its pressure gage back and forth, when pressures may be read with the hole in the searching tube in different positions throughout the length of the nozzle. From these figures a curve of pressures may be developed, and from this, together with knowledge of the weight of the steam passing the nozzle per unit of time and the exact form of the nozzle, a second curve may be developed which

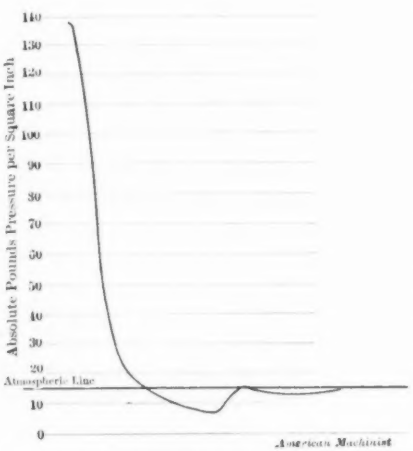


FIG. 4. EXPERIMENTAL CURVE OF PRESSURE OF STEAM FLOWING THROUGH AN ORIFICE.

will give some idea of the velocities of the fluid.

The curves of Fig. 3 give an example of this. They have, however, been developed theoretically assuming adiabatic expansion, that all the energy of the steam between the limits of pressure, viz., 150 pounds gage pressure and 26 inches vacuum, has been converted into velocity, and that there are no losses due to skin friction or through loss of pressure by low coefficient of efflux. This coefficient of efflux is a feature of the entrance to the nozzle and varies from 50 per cent. in an orifice in a thin plate to 98 per cent. in a well-rounded orifice, as is shown in Fig. 3.

The pressure curve is an adiabatic expansion line from the throat to the outlet, and the pressure at the throat is 56 per cent. of the absolute pressure of the steam before entering the nozzle. The velocity at the mouth of the nozzle is shown to be 3,810 feet per second; 982 pounds steam passing per hour; diameter of throat, 4-10 inch; theoretical horse-power, 111.5. In actual practice as much steam as this could not be made to pass, for the reasons just given, and the nozzle would require some modification in consequence.

Of course, in these investigations allowance must be made for the area of the searching tube. Fig. 4 is from an actual example of a nozzle designed for discharging into vacuum, but used for discharging into atmospheric pressure, and shows how the steam reaches near the condition of vacuum near the outlet and afterwards rises to the exhaust pressure.

This feature is to a certain extent taken advantage of in a De Laval turbine, designed for running non-condensing. The nozzle is slightly over-compounded, so that the wheel may revolve in a partial vacuum. Some gain in economy is the result, by reason of the wheel revolving in a less dense medium.

Fig. 5 shows somewhat of a curiosity. This form of nozzle was suggested as being as suitable as any that might have carefully constructed curved walls, the idea being that the steam itself would take the correct passage and give the same results, so long as the correct ratio of throat area and outlet area were maintained. It will be observed how the pressure line forms waves, which exactly correspond with some lines shown in the nozzle, from which it would appear that the steam particles fall very near to the exhaust pressure immediately on leaving the throat, and then strike the walls and rebound, meeting together at the point A, when they form a point of pressure, again striking the walls at B, meeting again at C, and so on.

In the De Laval turbine the nozzles are

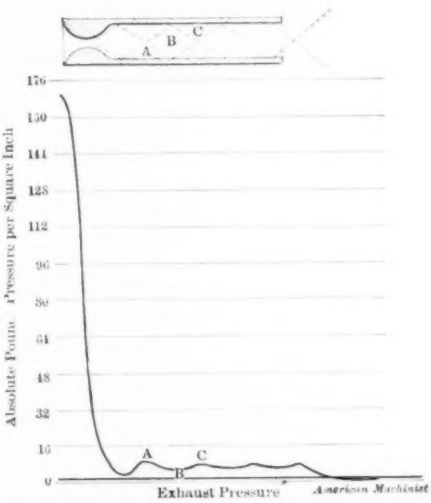


FIG. 5. A CURIOUS CURVE OF PRESSURE OF STEAM FLOWING THROUGH AN ORIFICE.

set at an angle of 20 degrees with the plane of motion of the buckets, which is as acute an angle as is possible.

These turbines, especially the larger sizes, are equipped with several nozzles, some of which are provided with independent stop-cocks, so that the number of nozzles in operation may be adjusted to suit the condition of running in order to obtain the most suitable steam pressure in the throats.

These turbines are essentially of very high speed. The smaller sizes run about 30,000 revolutions per minute and are geared down to about 3,000; the larger sizes run about 10,000 revolutions per minute. The peripheral speed of the wheel is usually from 600 to 1,200 feet per second. The reduction of speed is accomplished by means of a pair of helical spur gears with the angle of helix 45 degrees.

These gears form by far the biggest part of the whole outfit. The remaining portions of these turbines have no remarkable features. The regulation is effected by means of a flywheel governor which is on the slower-running shaft, and wire-draws the steam at the admission.

Some tests of a 10 horse-power turbine were communicated to the American Society of Mechanical Engineers in 1895, in which the turbine described had four nozzles of .138 inch diameter and one of .157 inch diameter of throat. The nozzles were 2 inches long from throat to outlet.

The speed of the turbine was 23,771 revolutions per minute, reduced by gearing to 2,400. The economy under full load, non-condensing, was 47.8 pounds per boiler horse-power. This economy is by no means bad when the small power of the outfit is considered.

In December, 1899, some tests were made in France, under the following conditions: Boiler pressure, 192 pounds; with 69 degrees Fahr. of superheat; mean horse-power, 307.8; revolutions per minute, 772. The consumption of steam was 13.92 per effective horse-power.

Mechanical and Other Treatment of Alloys of Aluminum and Magnesium.

Some interesting and valuable information relating to the manipulation of magnesium alloys of aluminum is contained in the specifications of two United States patents recently granted to Ludwig Mach, of Jena, Germany. Reference is first made to a previous patent in which was "described how magnesium exerts its influence on aluminum and affects its susceptibility to the action of cutting-tools. It was there stated that magnesium added in 10 to 30 parts to 100 parts of aluminum improves the susceptibility of the latter to the action of cutting-tools. By such an addition aluminum acquires many qualities which pure aluminum does not possess, and this without increasing but rather decreasing its specific gravity."

The present patent describes another process by which "the susceptibility of aluminum to the action of cutting-tools is obtained by the use of less magnesium than heretofore possible and without reduction the ductility of pure aluminum to any considerable degree. For this purpose the components are melted together in such proportions that 100 parts of the aluminum alloy will contain 2 to 10 parts of magnesium. This alloy of aluminum and magnesium in its mechanical properties, and in particular in its workability, scarcely differs from pure aluminum, and while it may be rolled and drawn it has the same objections as pure aluminum, for it is not capable of being satisfactorily worked by cutting-tools, and, for example, it clogs up files, etc. If now this alloy of only 2 to 10 parts magnesium and 100 parts of aluminum is subjected to a strong compressing process by rolling, drawing, pressing, etc., the properties of the material become quite different as contrasted with pure aluminum. The compressed new material possesses very much the same qualities which can only otherwise be obtained by essentially higher additions of magnesium—*i. e.*, the compressed alloy with the smaller proportion of magnesium can be excellently worked on by cutting-tools, etc.

"In carrying out the rolling process in practice the course to be adopted is as follows: The pieces of material are first run once, twice, or any requisite number of times through the rolling-mill cold. They are then heated to from 400 to 500 degrees centigrade, then again rolled cold once or several times, and so on, this treatment by alternately heating and rolling the blanks being repeated over and over again until the material has the density and the thickness desired. The expediency of heating the alloy is accounted for by the fact that the material without being thus heated or annealed at intervals becomes brittle, whereas the heating restores its original tenacity."

The specification does not say or indicate in any way whether the metal should be cooled slowly or quickly after the heating.

"These compressed alloys that contain from 3 to 5 parts of magnesium to 100 parts of aluminum give the best results, and both as regards its cohesion and its workability may be said to be equivalent to brass, while in regard to certain other properties—such as tenacity, for example—it is even superior to brass.

"An aluminum and magnesium alloy containing less than 2 parts of magnesium to 100 parts of aluminum cannot be suitably hardened by rolling. The condensed alloy of aluminum and magnesium herein described retains these qualities even though other metals, such as antimony and arsenic, are contained in it."

In the second of the recently issued United States patents here referred to, the beneficial effects of the mechanical condensing process are again spoken of:

"Aluminum treated in this manner is conspicuous for the readiness wherewith it may be wrought by means of cutting-tools. Subsequent experiments, however, have led me to the discovery that the same result is attainable by bringing the metal to the requisite degree of density not by mechanical condensation, but by sudden solidification or concretion by chilling, though, as in the prior method of treatment, from 2 to 10 parts (per cent.) of magnesium must be added to attain the desired object.

"The process is carried out as follows: 100 parts of aluminum are alloyed with 2 to 10 parts of magnesium and this alloy cast in sheet-metal (tin-plate) molds from castings of corresponding shape. The molds are then moved backward and forward in running water, their metal-receiving orifices being left open. Hydrochloric acid or mercury might be used instead of water, if preferred. In the course of my investigations it has been ascertained that this particular material or alloy is excellently adapted for the casting, while owing to its high degree of density it is workable with tools with remarkable facility as compared with pure aluminum. . . . . If, on the other hand, the melted aluminum alloy of from 2 to 10 parts of magnesium to every 100 parts of aluminum be concreted or "set" by a slow process, the castings will smear or smudge in being worked; but this drawback may be immediately removed by rapid chilling."

A Successful Shop Night School.

In a letter received from the American Machine & Foundry Company, of Hanover, Pa., relating primarily to other matters, their treasurer, Thomas M. Brown, writes as follows:

"We believe it to be of interest to your readers to learn of our experience in the line of carrying on a mechanical night school for the benefit of our apprentice boys and our mechanics who have not had the advantage of good schooling when young. We have now passed our sixth month with this school and find it of great advantage to us, and feel sure if the idea were carried out by others in our line, they would be as greatly benefited.

"This school is held in one of the public school buildings and is under supervision of our chief draft-man, Mr. L. Schlutter, who is a graduate of a technical school in Germany. No special qualifications are required of the boys or men, except a willingness to devote two evenings a week to the work. They are started in the elements of arithmetic and are carried through higher branches as rapidly as possible. At the same time they are instructed in mechanical drawing and carried through in this line as fast as their talents develop. The result of it is, that

our boys and men become more familiar with drawings, can make sketches well and rapidly, and, which is very important in our work, figure almost entirely in decimals. Our work being of a very close nature, the micrometer is universally used in the shop, and the experience the pupils get in the school aids them greatly in this decimal figuring."

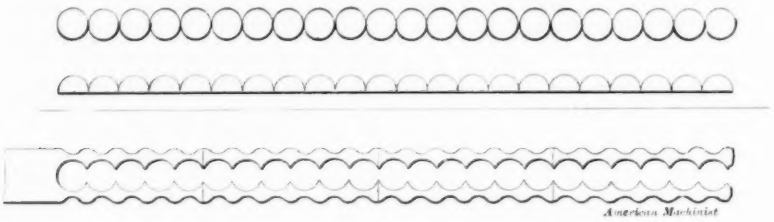


FIG. 1. A CONTINUOUS STRIP OF HEMISPHERES AND THE STRIP OF METAL.

Drawing and Punching Continuous Strips of Half Balls.

BY JOSEPH V. WOODWORTH.

In Fig. 1 are shown two views of a strip of thin sheet brass that has been drawn and punched to resemble a number of brass balls joined together. These were made in continuous strips and were used for ornamental purposes on wood fixtures. The strip of brass with the work is also shown in Fig. 1. The punch and die used for producing these strips are shown in Figs. 2 and 3 respectively.

In this case the punch, Fig. 2, was made first. A cast-iron holder *F* was first machined. A piece of tool steel *G* was then got out 3 3-16 inches long by 7/8 inch wide, to be used as the holder for the forming punches, and to act also as the trimming punch, it was left 3/4 inch high half way from the right-hand side and the other half was reduced to 1/2 inch. It was fastened to the face of the punch holder by the four filister head-screws *J J J J* and the two dowel pins *L L*, placed so as not to interfere with any of the holes for the punches. The holder was then set up in the miller with the front facing the spindle. The stock to be worked on was .010 inch thick and the balls when finished were to be 1/4 inch in diameter; we were to draw six and trim six at each stroke. After the work was set up, a center drill was used and, starting from the left-hand side, the first hole *H* for the forming punch was centered. A drill was then used .020 inch less than 1/4 inch and the hole was drilled almost through. The table was then moved forward exactly 1/4 inch and the next hole was centered and drilled, and the other four in the same way. The table was then moved another 1/4 inch and the next hole was centered and drilled and reamed with a special rose reamer .002 inch larger than 1/4 inch to the depth shown at *I I*. Then, with accurate spacing, the other five were drilled likewise. After these were all drilled the holes just run into each other. They were touched up and finished by filing to leave open spaces 3-32 inch wide to just hold the metal together after the punching. The punch *G* was then removed from the holder and finished.

Before finishing the punch the die, Fig. 3, was got out. A blank *B* of tool steel was planed and fitted by dovetailing to the bolster *A*. A butt mill was then made and finished to 1/8-inch radius and stoned to dead sharp cutting edges. The die *B* was strapped to an angle plate on the miller, facing the spindle, and with the butt mill in the chuck the first forming die *C* was made by running the butt mill down just .130 inch, then coming out and moving the table 1/4 inch and finishing the next one, and the same with the other four. The other six, *D D*, were spaced and milled in the same manner to .005 inch less in depth than the others, leaving six circles just 1/4 inch in diameter, the lines of which served as the guide for finishing the cutting dies. This was done by drilling and cutting out two sections, *E E*, one on each side, and filing from the back one degree taper from the cutting edge to just the edges of the circle, leaving a nick between each 3-32 inch wide, as will be seen in the plan view in Fig. 3.

The punch, Fig. 4, was then carefully hardened and drawn and entered into the die just fitting and showing up the tight spots. These were then eased up and the die hardened and drawn to a blue. The face of the die was then ground down .005 inch, thereby leaving the forming dies just .125 inch deep and the cutting die .120 inch and leaving a margin around *D D* .002 inch wide, which was necessary, as a dead sharp edge would not have stood up. Holes were then drilled in the bottom of the bolster *A* to allow the escape of the scrap.

The stripping was done in the punch in the following manner. A stripper plate *K*, of 5-32 inch flat cold-rolled steel, was made and worked out to fit around and within the punches as shown: that is, fit-

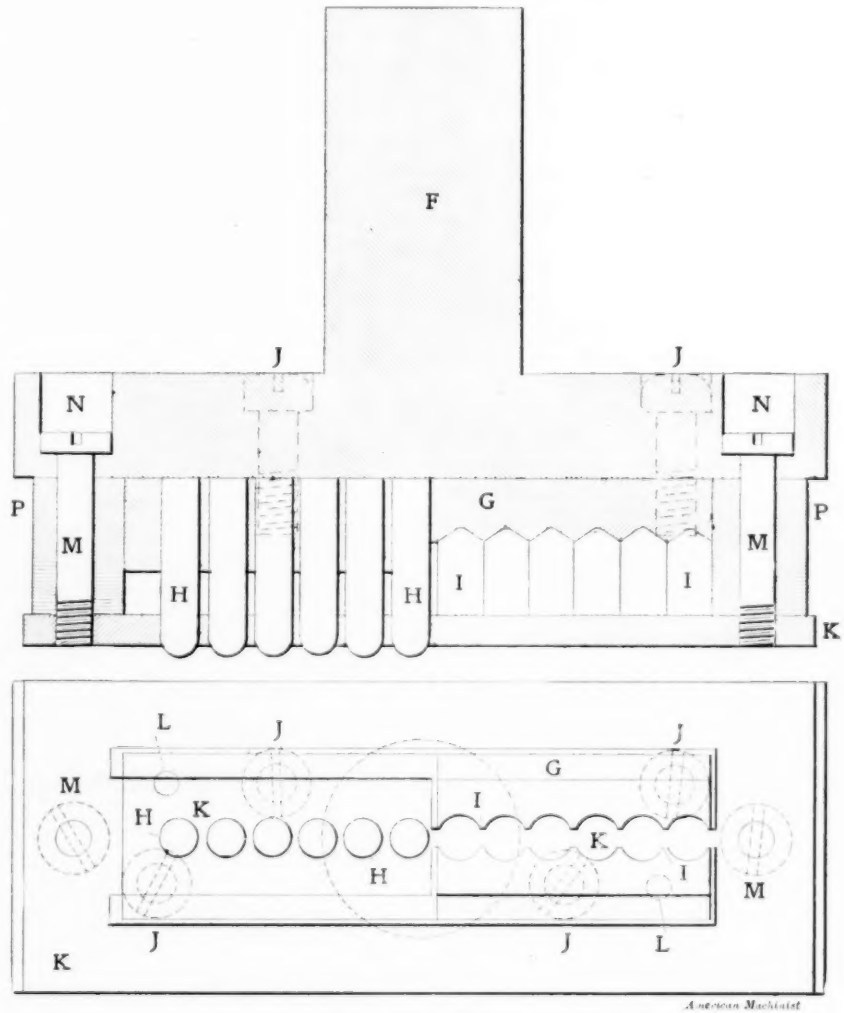


FIG. 2. THE PUNCH.

ting freely around the drawing punches *H H* and within the trimming punches *I I*. Two studs or screws *M M* were then made, and let down through the holder *F*, shouldering in the bottoms of the counterbored holes *N N* and screwing tightly into *K*. This allowed the stripper plate to move up and down freely. A piece of good stiff flat spring rubber *P*, ⅞ inch thick, was then placed between the face of the holder *F* and the stripper plate *K*, being cut away in the center to clear the punches. When the screws *M M* were tightened and adjusted to hold the stripper plate *K* perfectly level, there was enough spring in the rubber *P* for all purposes. I neglected to state that the holes for the forming punches *H H* were drilled straight through, to allow the punches to shoulder against the face of *F*. The punches were then made and finished to .105 inch in diameter, and the points, with a special forming tool, to a radius of .0525 inch. They then were hardened and drawn to a blue in the back, leaving the points very hard. The points of these *H H* and the forming dies *C C* were lapped and highly polished. After all parts were assembled and adjusted, they were set up in the press, and a roll of metal of the width shown in Fig. 1, was placed in a reel on one side and to wind up on another on the other side. It will be seen that by placing the stripper and the metal holder on the punch the work is constantly before the operator, and there is no trouble in locating it on the die. The strip was first moved in far enough to cover the six forming dies and project slightly over the trimming dies. The punch descending, the metal was held by the pressure of the rubber *P* while being formed and drawn and the cutting punch trimming the end. At the next stroke the strip was moved along far enough for the six balls previously formed to locate themselves within the forms of the trimming dies *D D*. The punch then formed six, and trimmed six, at each stroke, cutting the scrap in the die in sections, as shown by the cross-lines in Fig. 1. The strip was moved along continually until the entire length was finished, trimming and forming nicely, there not being a burr or a line to show where the successive sections commenced or finished. The one thing most necessary in work of this kind is accuracy in spacing, as the die cannot be used, as is usually the case, as a gage to transfer the holes to the punch.

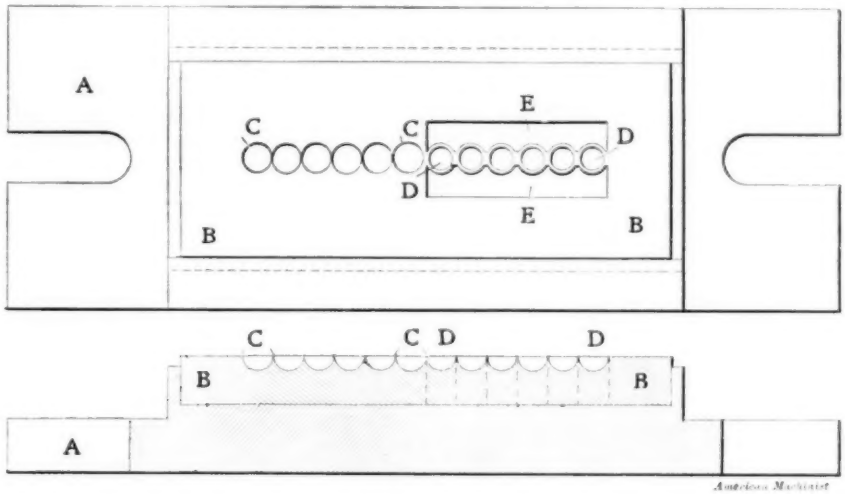
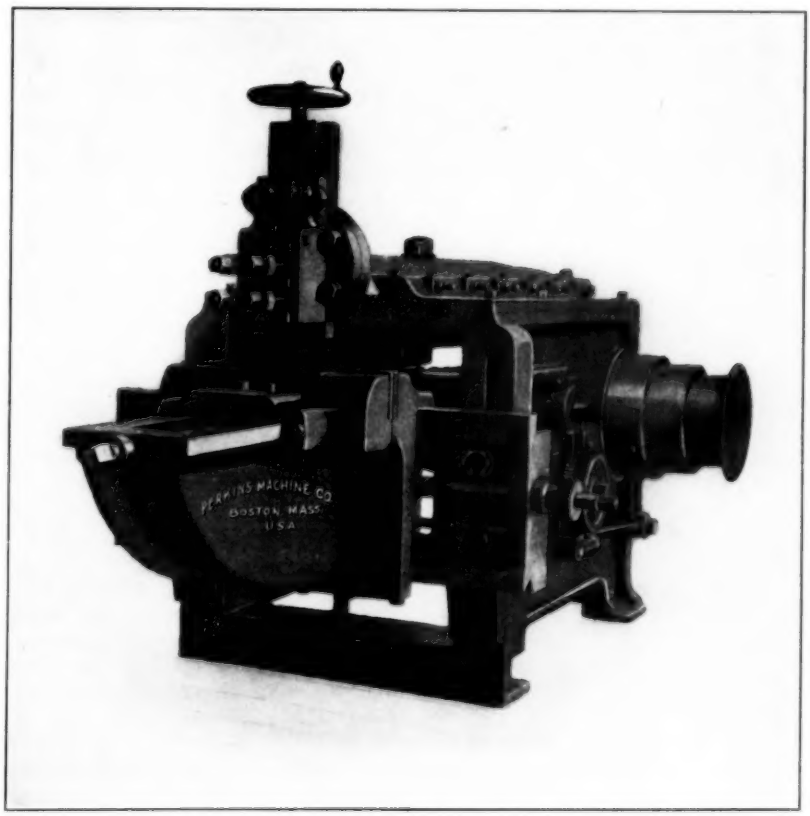


FIG. 3. THE DIE.

A Snagging Shaper.

The half-tone shows a tool that is intended to be used all its days for the roughest and heaviest kind of chip-making. It is never to know anything about micrometer adjustments, and is not expected to be handled with any tenderness. As a certain builder of high-class Corliss engines had also a line of slide-valve engines for sawmill work, which latter he used to call his "mules," so this may be regarded as a mule among shapers. It is used in foundries for cutting off sprues, and especially for the big risers usually so unavoidable on steel castings. It also finds suitable employment on structural work, both of cast iron and of steel, and in numerous other lines. It has been specially designed for this class of work, and the requirements have probably been as carefully considered and as fully provided for as in lines of tools that are considered finer. The builders say that "it will take a chip as large as you can give it." They tell of a case where a 250-pound man uses a 3-foot wrench with a pipe 10 feet long on it to tighten his work in the vise, and the machine never complains. The ram of the machine is 7 feet long, with a stroke of 18 inches. It has the Whitworth quick return, giving it a speed of 3 to 1 for the return stroke. The tool-holder, as will be seen, is made for heavy tools. It has a vertical movement of 8 inches. The cross-head screw is 48 inches long, with a cross-feed of 36 inches. The vise jaws are 24 inches wide and will open 20 inches. The cross-rail when raised or lowered, is clamped by the nuts seen in front, a socket wrench being used. The diameters of the three steps of the cone pulley are 10, 12 and 14 inches, respectively, for a 4-inch belt. The machine is built by the Perkins Machine Company, South Boston, Mass.



A SNAGGING SHAPER.

Making Sand Castings of Copper.

BY C. VICKERS.

Copper when in the molten state absorbs, or develops, gases, which permeate its mass and are imprisoned therein as the metal solidifies, making it porous or spongy. Owing to this peculiarity, castings of pure copper cannot be made, no matter how carefully the metal may be melted and its surface in the crucible protected. It is always necessary to add some metal or metalloid that will combine with and remove these gases.

In 1823 Robert Mushet took out a patent in England for a process of improving the quality of copper and making it more suitable for the sheathing of ships, etc. He recommends the following proportions:

(1) 100 pounds copper, 2 ounces zinc.

(2) 100 pounds copper, 2 ounces zinc, 4 ounces antimony.

(3) 100 pounds copper, 8 ounces of arsenic.

(4) 100 pounds copper, ½ ounce zinc, ½ ounce tin.

(5) 100 pounds copper, 2 ounces arsenic, 1 ounce antimony.

(6) 100 pounds copper, 1 ounce zinc, 2 ounces antimony.

The alloying metals are added after the copper is melted, its surface being protected by a covering of charcoal or other material. Great care must be exercised in handling arsenic, not to inhale the fumes. It should be wrapped in blotting paper and pushed under the surface of the metal. When stirring liquid copper an iron bar should not be used, as iron is highly injurious. A good stirrer is made by sawing a strip, about 2 inches wide, from an old "seventy" or "eighty" crucible, then taking a piece of inch gas-pipe 6 feet in length, splitting one end for about 8 inches, spreading the split end to admit the piece of crucible and then wedging in place.

Another method of making copper castings solid, as invented by Walton, is as follows: Mix 8 pounds of either oxide or carbonate of zinc with 1 bushel of ground charcoal; wet, and make into a stiff paste, using molasses water, and portion it into rough balls of the size of an orange, and dry at a moderate heat. When the copper is just melted, drop in one or more of the balls, so that, when they drop in pieces, the surface of the metal will be entirely covered, thus excluding the atmosphere. The zinc in the mass is liberated and, according to the inventor, combines with any oxygen that may remain in the crucible. By this method only a very small proportion of zinc is alloyed with the copper.

Another method is, to add a quantity of cyanide of potassium shortly before removing the melted copper, which is well stirred before pouring into the molds. Cyanide of sodium and yellow prussiate of potash also may be used.

Gretchell recommends: To every 25 pounds of copper, heated to redness in a crucible, add 1½ pounds potash or soda, 1 pound alum, ¼ pound of bone dust and ¼ pound zinc or tin; melt, remove slag, cover with charcoal and run into ingots. He claims that this makes the metal hard, dense and tough.

T. D. Bottome says: Cast copper is hardened and toughened by treating it, when in the molten state, with sodium or its vapor. For small quantities, under 10 pounds, a graphite crucible with an asbestos cover is used, and about one-tenth per cent. of pure sodium is introduced into a cavity in a carbon rod and stirred into the metal, which is covered by a layer of common salt. For larger quantities a mixture of bicarbonate of soda and anthracite coal is placed above and below the copper in the cricible, and the sodium vapor is produced by the reduction of the sodium salts. If the castings are too soft, they should be quickly reheated and allowed to cool in hot graphite dust. He purifies impure copper by stirring into it a mixture of 3 parts nitre and 2 parts argol. Phosphorus also is used to prevent porosity in copper. A reliable mixture for hammers, soldering bits, etc., is: Copper, 100 pounds; zinc, 1½ pounds; stick phosphorus, 1½ inches. Silicon copper also is recommended in the proportion of 1½ to 2 pounds to the hundred of copper.

In summing up the effect of these various alloys on copper, we find that, according to Ledebur, tin alloys with copper and diminishes its extensibility, a marked diminution being only produced when the proportion of tin reaches 1 per cent. Zinc alloyed with copper diminishes its malleability when hot. A zinc copper alloy, containing over 20 per cent. of zinc, is less malleable than copper at all temperatures.

Dr. Carl Schnabel says: Lead can be melted with copper in all proportions, but the greater part can be liquated out by a gentle heat; 0.15 per cent. of lead does not affect the malleability of copper in any way; with 0.3 per cent. of lead it becomes slightly red short; with 0.4 per cent., slightly cold short. Arsenic in small quantities has no injurious effect. Hampe found that 0.5 per cent. produces no bad effect. Only when the arsenic reached 1 per cent. could a slight degree of red shortness, but no cold shortness, be noticed. Copper with 0.8 per cent. of arsenic could be drawn into the finest wire. Antimony up to 1 per cent. does not affect copper; over 1 per cent. it makes it extremely red short. Taking Hampe again as our authority, we find that "silicon hardens copper without impairing its toughness or malleability, when less than 3 per cent. is present; 6 per cent. makes it brittle, and with 8 per cent. it can be pulverized." In cases where a high electric conductivity is not especially desired, the copper, zinc, phosphorus and silicon alloys can be relied upon to make good, sound castings. In castings for electrical machines, such as commutator bars, etc., it is highly important that the conductivity shall be retained as near to that of pure copper as possible, and the metal that is highest in this respect will be most in demand for such purposes. Antimony, phosphorus, silicon, arsenic and aluminum all diminish the electric conductivity of copper. The conductivity of aluminum is only 59, that of pure copper being taken as 100. Many experiments have been made in order to obtain solid copper castings having a high electric efficiency, and consequently various secret processes are in use. One of these is: Take of Cowles silicon, aluminum and copper alloy (pulverized) and oxide manganese equal quantities; mix. To 2 ounces of this add an equal quantity of a flux, composed of borax and nitre, equal parts; tie up in paper and mix with 100 pounds of copper five minutes before pouring. A high degree of electric conductivity is claimed for this metal; it is slightly cold short. Its chief drawback seems to be the difficulty of obtaining clean heavy castings. Thin, light castings are as clean and smooth as can be desired. The heavier work, however, is very difficult to "get," no matter how gated. In the opinion of the writer, the use of aluminum in copper is undesirable for several reasons; one of which is the difficulty of using up the gates and scrap in brass and bronze, owing to the whitish discoloration characteristic of aluminum, which gives the customer the impression that poor scrap was used in making the castings.

Echoes from the Oil Country.

HOW WE PICK OUR MEN.

The shop has been very busy lately, and we have been taking on some men. Mr. Smith has up to this time always done all the hiring, and I have been very much interested in his methods. Lately he intimated to me that I had better take hold of that, too, and this brought out what proved to me to be a very interesting conversation.

"Why didn't you hire that man from Philadelphia?" I asked. Mr. Smith closed his eyes a little, looked out through the shop, crossed his legs the other way and then laughed.

"This isn't much of a shop, is it, Osborne?" said he. "Well, when that chap came in, he looked over the place with a very condescending air, and his first words were patronizing; gave me to understand at once that he would be doing me a very great favor to work here; would make me feel I was doing the world an injury by hiding his light in this out-of-the-way corner, under a bushel. I don't mind looking like thirty cents, but I hate to feel like it, so I didn't hire him.

"Of course you wouldn't expect me to hire that fellow that came in and spat all over the floor and blew the fumes of the vilest kind of a toby in my face while he talked. If he couldn't be decent a few

minutes, while looking for a job, what would he be after he was here a few days?

"That auburn-haired youth? Yes, he was nice, pushing, ambitious and intelligent; no doubt of it—not the least bit. Only one thing the matter with him.

"Did you talk with him any? Well, I did; and he isn't a machinist by any means—hasn't even worked around a machine shop. Just expects his natural shrewdness and quickness to carry him through.

"How do I know? Nothing easier, in his case. He couldn't talk the language. Could I pass for a Frenchman in France?

"The turning tools may be cutting chisels, drills may be boring bits or augers, nuts may be burrs, hammers may be mallets, and gears on the lathe may be cog-wheels; but the man that calls them so didn't learn to in a machine shop, in this section at least; and he would need to talk pretty broken to carry the idea that he did in the old country.

"When a man comes to me and says, 'I came to you to see if I could arrange for the hire of the use of that apparatus that can be so adjusted, in relation to a surface, that it will hold an instrument in such a way that it can be so manipulated as to cause a cavity of a definite shape to be formed in an otherwise solid and compact substance, by one of its attachments; I also want the instrument and attachments necessary to a successful termination of the undertaking,' I may know he wants an old man and ratchet and drill, to put a hole in a piece of iron, but I also know that he hasn't worked long enough in a shop to be very expert in their use.

"That chap that I did hire just dropped in and said he saw the lathe standing still, and thought he would like a try at it, seemed to feel at home in the shop; asked me if the feed ever stuck when you wanted to throw it off quick. Wiped off the ways and dropped a little oil on before he ran the carriage along to see how she handled; just seemed hungry to get to work. I'll be fooled if he isn't a good man. His eyes are too clear and steady for a drinking man, and his breath don't smell of cigarettes.

"By the way, Osborne, speaking of cigarettes, don't ever hire a boy that uses them. It's no use. The chances are he'll let you down. I've never had a confirmed user in the place but what I had to get rid of him sooner or later. I'd rather have a soak, for some of them are good between spells.

"Look out for the young man that has worked in twenty-seven places in less than four years, and the fellow that tells you of the terrible lot of poor work and poorer workmen in the neighboring town; so bad, indeed, that he just refused to stay there. Don't look for angels, though. The fellow who has them generally knows enough to keep them. Get a man, see that he is a man; use what skill he has, treat him white, pay him what he is worth to you. If he does not seem to respond to that, let him go, no matter how bad you need a hand or how bad he needs a job.

"Did you ever meet the chap whose whole claim to a job was the fact that he was hard up? If everyone could get a job that would pay all we could spend, wouldn't some of us be drawing fat pays, though?

"One of the greatest pleasures of my life has been to find that a man had so far forgot himself that he had got to be so valuable that I couldn't honestly afford to let him work for the same wages, and so go to him and tell him he would either have to take more money or do less work; and, somehow, it don't seem to hurt that kind of a man to raise his wages. Some fellows work every way for a raise from the first pay, and if you give it to them it swells them up so far they can't get down where they can do a day's work.

"But you'll have to learn these things yourself, and mind, most of the men are bricks in most ways; but all bricks don't mate together and all are not suited for the same job; so try to get the right-shaped bricks."

Just then Sammy came in, holding up a bloody finger and asked me to tie it up. He said he had been putting on another trade-mark, so folks would know he was a machinist, "because, you know," said he, "most of 'em have at least part of one finger gone." W. Osborne.

The Straw Foreman.

Be easy with the straw boss, boys. He has a hard row to hoe, and you may be there yourselves sometime.

He has just been reprimanding Joe for coming in late (Joe, by the way, is from two to ten minutes late every morning), and after talking to him for ten minutes and trying to reason with him, Joe gives S. B. a pleasant smile and comes in late next morning just the same. The straw boss can't fire him, and Joe knows it, and so he and everyone else do just as they please. The super' gets in about 8.30 every morning, and consequently knows nothing about this and S. B. says nothing to him about it, as he knows he will only get a reprimand himself for not controlling the men better.

None of the men have any respect for the straw boss, and, if the truth were known, he probably hasn't much for himself; at least, if he has, he is sure to have less in the near future if he stays there. He has a good chance to see what men will do, and how much liberty they will take. He tries to treat them reasonably and like men, and nine out of every ten of them act like hogs. They take five hours to do four hours' work, read newspapers or go over to the other side of the shop and argue about the last prize-fight and the merits of the contestants, when a running cut permits (it doesn't matter whether the straw boss permits or not), then get sassy when S. B. comes over and tells them their machine is taking a wind cut and has been for five minutes.

S. B. starts Brown on a job one morning; it is a piston rod, and is wanted that night sure, and tells him to keep it going so as to be sure and get it finished. Brown is one of the best men in the shop, and is one of the few who act as they should. Three hours afterward Black, the super', comes in, takes Brown off that job and sets him onto another, and he works on it all the rest of the day. Just before quitting time, in comes the man who ordered the rod and inquires of S. B. if it is done. S. B. says it is not, and the man is furious; says he thought S. B. was a man of his word and that hereafter he will get his work done elsewhere. The man goes to the office and raises a row, as he is put to great inconvenience by his failure to get that rod. Next morning the following dialogue takes place in the shop:

"Mr. S. B., why didn't you get that piston rod out yesterday?"

"Because, Mr. Black, you stopped the job."

"Well, why didn't you set someone else at it?"

"Why didn't you set someone else onto your job instead of stopping Brown on mine? You ought to figure on results before you do anything like that."

"Mr. S. B., that is none of your business. I want you to ask no such questions of me, but tend to your business and get the work out as you are paid to do. Now, the shop has to pay for three hours' work on that rod and lose the stock in it, besides a good customer, and all through your negligence."

S. B. walks away crushed.

Next day Black changes somebody else onto another job in the same way. Then Black's son-in-law, Green, comes in and sends a man outside on some job and also goes around the shop reversing S. B.'s orders generally, and all without S. B.'s knowledge.

S. B. misses the man Green has sent out, but can't locate him till he learns accidentally where he is gone. Next he finds a man doing a job contrary to the original order, and after asking why he is doing it that way, the man says Green told him to do it that way, and that that is the way he is going to do it.

S. B. can do nothing, so he walks away, mad, and wondering when this sort of thing will stop. And thus it goes on, S. B. gradually losing his control over the men until one day Mr. Black says: "Look here, S. B., I can't have this confusion in the shop; there is not half the work turned out there should be, and the firm is making no money. Green and I have assisted as much as possible, but you seem to get worse every day."

"Well, Mr. Black, you are not assisting me at all; you should keep your finger out of the pie altogether. Let me change

orders if necessary, and give all orders myself. There are three bosses here, and three are as good as none, and I am responsible for the mistakes of all three, so from now on there will be one boss less, and that will be me."

Exit S. B.; and some other unfortunate, ignorant of the conditions, comes in and goes through the same experience.

Rather a queer way to run a shop, does someone say? Yes, but there are plenty run that way just the same.

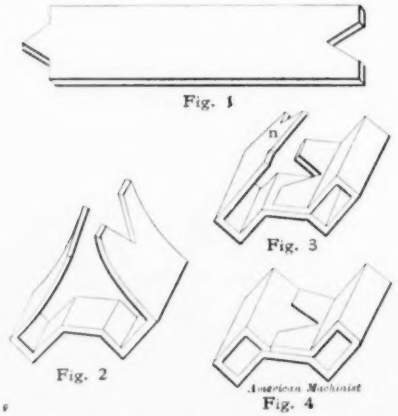
X. P. RIANTS.

A Novel and Ingenious Cutting and Bending Die.

BY GEORGE W. FREEMAN.

In die making there are many points to be considered besides the mechanical operation. The requirements may be for a limited number, in which case the dies would necessarily be cheap and simple. But for regular, extensive and continued production there is often much inventive ability required to get the product out as quickly and cheaply as possible. Stock must be saved in getting out the blanks, the bending must be done in as few operations as possible, and the die must be entirely practicable to make and to operate.

Fig. 1 shows the blank, which is cut from a continuous strip of soft copper, 1-32x5/8 inches. Figs. 2 and 3 show successive bending operations, and Fig. 4 is the completed article. Fig. 5 is the cutting-off die, which continuously gives the correct shape to the ends of the blanks. The stock lies in the channel *a*, and at each ascent of the punch it is fed along to strike the gage *b*. The back of the punch when cutting slides against the projections *c*, so that it will not spring away from the cutting edge of the die. It will be seen that after the first end of the strip is cut, no stock is wasted.



THE BLANK AND THE BENDING OPERATIONS.

The bending of the blank to the completed shape shown in Fig. 4 is done in three operations. The die for the first of these is shown in Fig. 6, the resulting shape being that of Fig. 2. The punch used in connection with the die in Fig. 6 is shown inverted at the right. This die employs a device which is believed to be original with the writer—that of the rolls *c c* as a part of the bending die. These rolls are fitted to turn easily in channels in the die, their length being equal to the width of the die; they are held in position endwise by the round-head screws, as shown. At each end of the die is a screw *d* with a check nut. The points of these screws project into grooves in the rolls and determine the limits of their rotation. When the rolls are free from the punch and the work, the springs pull them to their normal position, which brings their upper lips nearly coincident with the vertical sides of the opening in the punch. The position in which they are shown in the cut is that which they assume when the punch has reached the bottom of its stroke and the work has been bent over it. When the punch rises the work rises with it and is slid off endwise by hand, the rollers of course moving backwards to release the piece. The work is not shown in the cut in its correct position, as it has been brought forward to the edge of the die in order to show it more satisfactorily. The work of course is done in the center of the die, the blank being laid upon the surfaces *b b*, between the adjustable gages *a a*. The use of the rolls in this die saves at least one operation upon the work, as by their action the material is bent considerably farther than it would otherwise be possible to do.

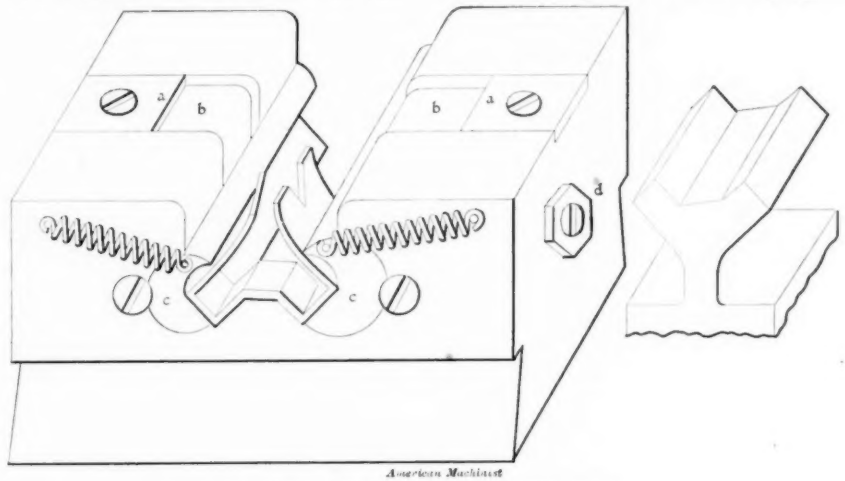


FIG. 6. DIE FOR FIRST BENDING OPERATION.

In the next bending operation, which leaves the work as shown in Fig. 3, the die shown in Fig. 7 is used, in connection with the punch *A* and the former *B*. The surface marked *m* on the punch is for bending as far as possible the end *n*, Fig. 3. In the last operation the same die is used in connection with punch *D*, the former *B* being again used. The little pin *o* on the corner of the die is used for pulling the work off the former, the last operation setting it close.

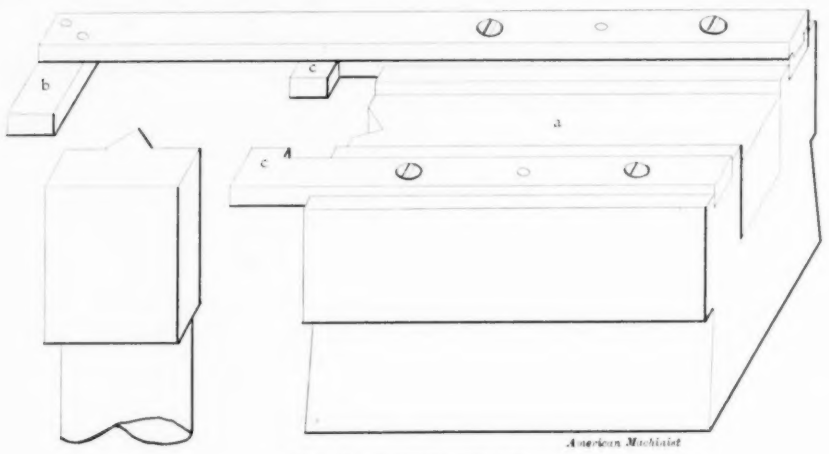


FIG. 5. CUTTING-OFF DIE.

The Howard Gasoline Launch Engine.

BY HERBERT L. TOWLE.

At the automobile show in Madison Square Garden, November 3 to 10, there was exhibited for the first time a four-cycle launch motor of exceptionally neat and attractive design, the work of Mr. W. S. Howard, late of the Noye Manufacturing Company, Buffalo, and now connected with the Grant-Ferris Company, of Troy, N. Y. This motor was the subject of many complimentary remarks among gas-engine men, and the writer esteems it a privilege, therefore, to be able to give a full account of it to the "American Machinist's" readers.

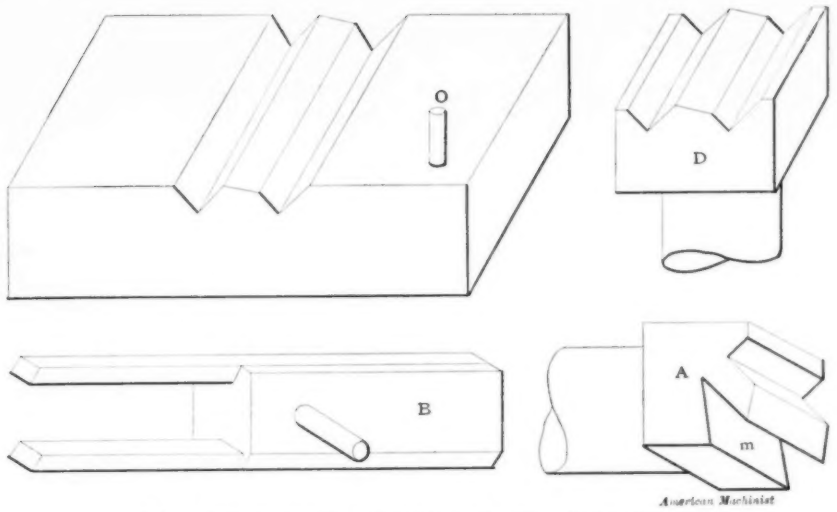


FIG. 7. DIE, PUNCHES AND FORMER FOR FINISHING OPERATIONS.

As the photographs, Figs. 1 and 2, show, it is a twin-cylinder engine, with cranks 180 degrees apart and an enclosed crank case. Its most original feature is that the cam shaft, gas and exhaust valve mechanism are wholly enclosed within the crank case and the bounding planes of the cylinders. Nothing is exposed but the igniters and their rods, and at first glance the motor would be taken for a two-cycle engine. This is accomplished, moreover, without internal complexity or weakness, and without rendering difficult of access any parts liable to wear or to need adjustment.

By reference to Fig. 3 it will be seen that the cam shaft and exhaust valves lie in the middle plane dividing the cylinders. The cam shaft has a cam keyed on each end, and on its middle is keyed a helical gear, driven at 2 to 1 reduction by another helical gear on the crank shaft just below it. The middle shaft bearing, which is carried on a web across the lower half of the crank case, is cast with a pocket for the helical gear on the crank shaft; and the cam shaft bearing, which is likewise cut out for the other pinion, is cast integrally with the cap on the crank shaft bearing.

Fig. 5 is a horizontal section just below the top of the cylinders. It shows the form of the passages from the cylinder space to the exhaust valves. The latter open into a cored continuous chamber extending clear across, one print opening of which in the casting is tapped for the exhaust pipe, and the other for a plug. Below this chamber, and keeping clear of the valve stems and their springs, the water jacket is carried across between the cylinders. This connecting water space reaches down as far as the bottom of the main jacket, and below it is cored an air space communicating with the crank case below. Two cover plates of cast aluminum are recessed into the "doors" of this air space, and when they are in place the exhaust mechanism is wholly covered.

The water jacket is closed at the top, and has two large rectangular print openings fore and aft, which are closed by aluminum cover plates. Holes are drilled into cylinder and head water spaces, at the joint, for circulation. The cylinder head has a transverse gas chamber similar to the exhaust chamber, except that it is cored open only at one end, the valve openings providing places for other prints. As the water space in the head is thereby cut in two, external pipe connections are necessary between the halves. The inlet valves themselves are made as light as possible, even to drilling the stems and recessing the valve disks to eliminate useless metal. In consequence, very light springs suffice to seat them promptly at the end of the suction stroke, and the resistance of the valve to the mixture is therefore minimized.

An annoyance incident to splash-lubrication as usually arranged is that, with the smallest excess of oil in the crank case, the cranks or rod ends will throw oil in large quantities on the cylinder walls below the piston, whence it works up by capillarity around the piston, producing a smoky exhaust and fouling the cylinder. This is prevented in the present engine by a bottom ring on the piston, which, pressing against the cylinder walls, scrapes the surplus oil down as fast as it rises.

The connecting rods, in the small sizes, are cast of bronze in H-section, which gives the maximum stiffness and at the

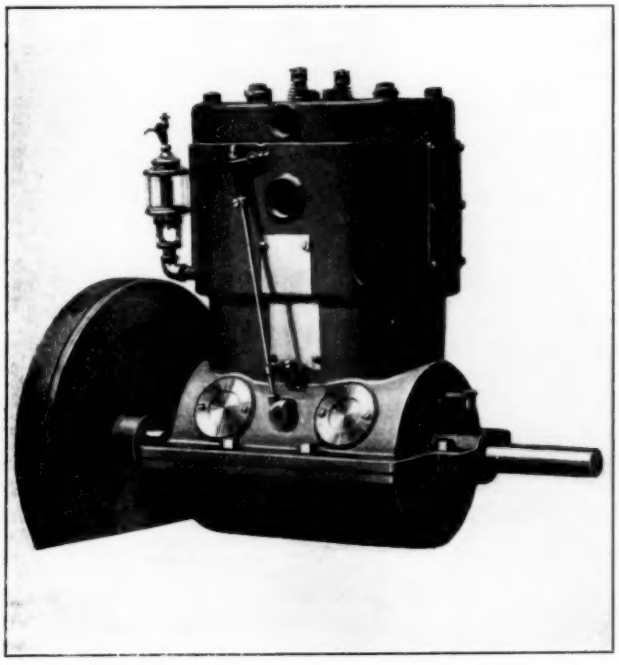


FIG. 1. THE HOWARD MARINE MOTOR.

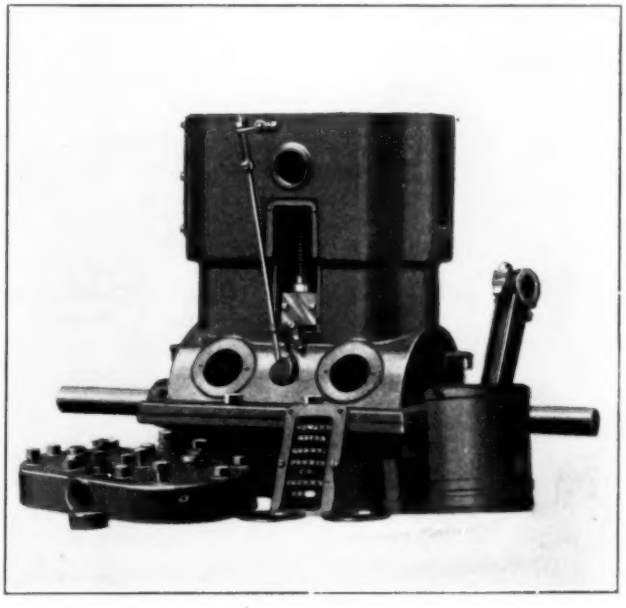


FIG. 2. THE MOTOR DISMOUNTED.

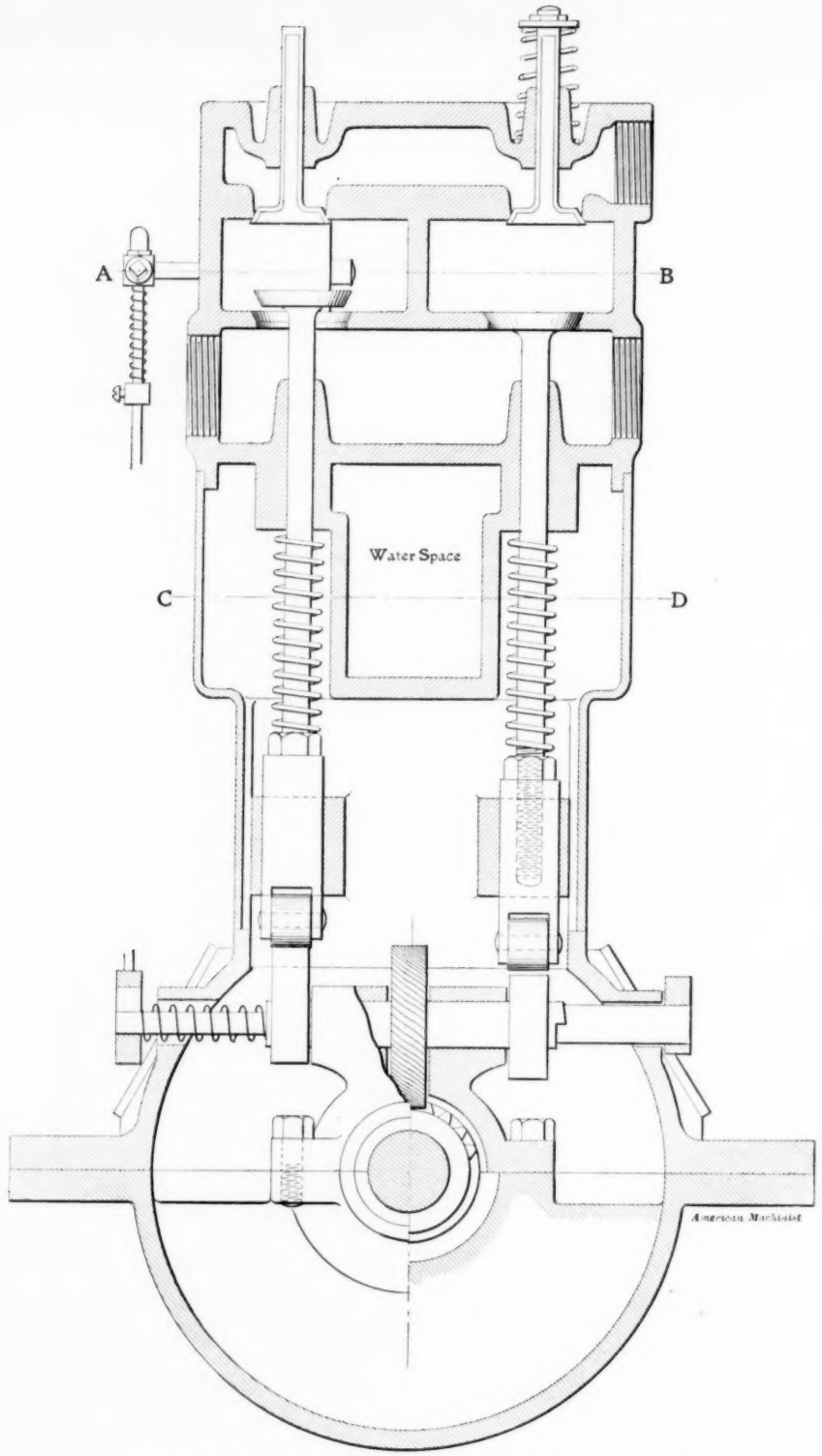


FIG. 3. SECTION SHOWING CAM SHAFT AND EXHAUST VALVES.

same time allows plenty of room for the cap bolts at the ends.

To the writer's mind, the igniter is far from being the least interesting feature of the Howard motor. It is generally admitted among gas-engine builders that, where the primary spark is used, it should be produced by the quickest possible separation of the electrodes, else an excessive battery current is required to produce a good spark. This can be accomplished either by making one electrode a spring and snapping the other past it, or by forming the movable electrode as a finger on a stem, which stem passes through the cylinder wall and has a ground collar inside to prevent leakage. Of these the latter method is usually preferred; and for the best effect the rocking stem usually carries an arm arranged to be struck a sort of hammer-blow to break the circuit. If, in addition, the timing of the spark is to be made variable, we have a combination of requirements, to fill which the amateur will generally want at least two springs, a trigger or two and quite a lot of links, pawls and other kickshaws to swallow money and make trouble. The Howard igniter has but one spring; the circuit is open about four-fifths of the time in each cylinder; the ignition time can be adjusted simultaneously in both cylinders; it works with very little noise; and, except a set-nut or two, there is practically nothing about it to get out of order.

The photographs show the arrangement quite clearly, the long rod passing loosely through a hole in the arm on the igniter stem, and ending in a nut and check-nut; the compression spring holding the arm against the nut, and the snap cam below, carried out from the end of the cam shaft. With the first ⅛ inch of the rod's rise, the electrodes inside the cylinder are pressed together by the spring; then the rod rises still further, ⅛ inch or so, and snaps down, the impact of the nut on the arm causing a wide separation of the electrodes. The little jointed guide just above the cam is attached to a stem which passes through to the other side, where a similar guide has a handle attached, with a spring pin moving over a perforated plate, for advancing or retreating the rod ends on the cam. Though this adjustment is now performed by hand, it is intended to add a governor, which will regulate the ignition lead according to the speed of the motor.

Whenever a snap cam is used to work the igniter of a gas engine, either the cam or the part against which it works must be free to yield in case, for any reason, the engine turns backward. This is accomplished in the Howard engine by the ingeniously simple device shown in detail in Fig. 7, which shows the snap cams in their places on the shaft. The shaft itself extends only through the exhaust cams *a a'*. It is drilled hollow, and through it passes the stem *c*, enlarged at one end, on which the snap cams are secured by the screws shown. The shaft and enlarged part of the stem engage at *b*, and the spring *d* keeps them together.

At present Mr. Howard uses the vaporizers made by the Lunkenheimer Company, and finds them quite satisfactory after the springs have been doctored to bring them to the tension found by trial to be the best. With these vaporizers, and feeding warm air, the power of the 4½x 4½-inch engine is quite close to 1 horse-power per hundred revolution per minute, within all ordinary limits of speed. It would probably be rated at 6 horse-power.

The alert reader will readily perceive that the difficulty of producing such a casting as that composing the cylinders of this motor is fully equal to the beauty of the result when the feat is successfully achieved; and he will not be surprised to be told that for several weeks three castings a day were poured and spoiled, before the perfect shape finally emerged from the sand. "We nearly had our foundry

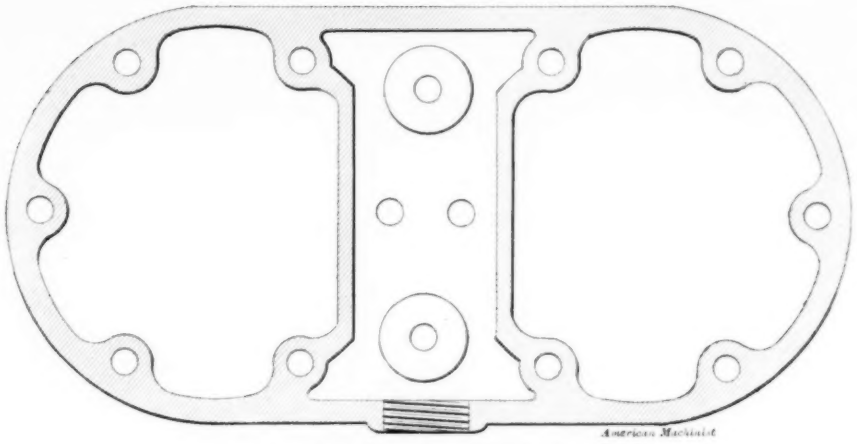


FIG. 4. SECTION THROUGH CYLINDER HEAD.

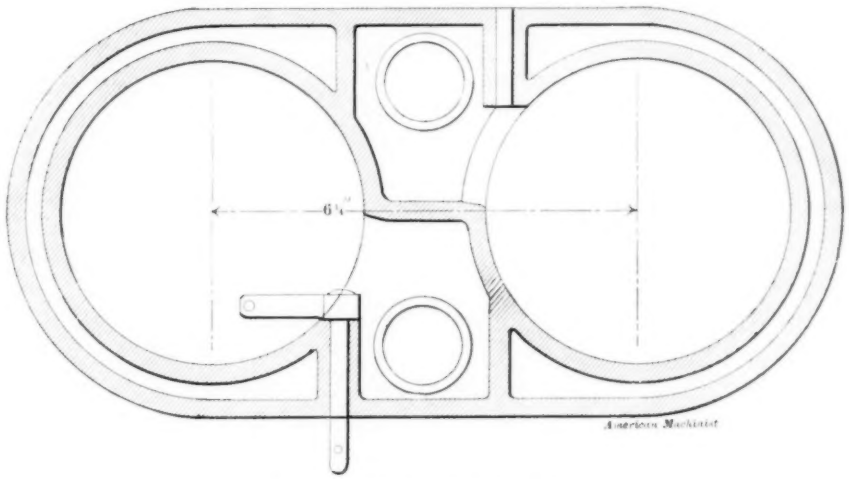


FIG. 5. SECTION ON LINE A B.

go on strike on account of those cylinders," remarked Mr. Howard to the writer, with a laugh, as he recounted the experience. Suffice to say that the intricate problem has been solved, and that the cylinder castings are now produced with as little loss as with most cylinders having a cored jacket.

Letters from Practical Men

British Board of Trade Examinations

Editor American Machinist:

The paragraph about "A Hero of the Taku Forts," in issue No. 50, of last year, reminds me of a question supposed to have been asked in the British Board of Trade examination for marine engineers. The examiner, in the oral examination, asked one of the competitors (an American, so the story goes):

Q.—"Supposing you had gotten your boiler ready for sea, all the manhole doors on, and had tightened up nuts on the dogs yourself—the gaskets all new, and consequently liable to be compressed somewhat—the ship leaves port; three or four days elapse and on going into the stokehold you notice that the dogs are all more or less loose. Suppose by some chance one of the dogs gets moved around on the stud in the door, so that the door can fall in. The steam pressure is 80 pounds. Suppose this door falls in, what would you do?"

A.—"I would immediately take off my clothes and dive into that boiler after the door; for a door that could fall in with 80 pounds pressure on the boiler would be well worth investigating."

Probably the Taku boiler was one of the same build; which reminds me of another Board of Trade question. The candidate had been almost stumped on the arithmetic part of the examination, and had very little hope of passing at all. In the oral examination he had a man who is noted to this day as a bad-tempered, aggravating examiner, very fond of asking catch questions, and only too happy when he can floor a man and send him back to sea for three or six months. He had badgered the poor competitor till he did not care whether he passed or not, when this question was sprung on him:

Q.—"When the crank of an engine is at half stroke where is the piston?"

This was the Scotch engineer's chance to get back at him, and in broad lowlands he replied: "Whaur the h——l wad it be but in the ceelinder?"

The British marine engineer looks down on a man who has risen from fireman to engineer, as it is usual for a man to serve his apprenticeship first (the law says at least three years in a shop where engines are built and repaired), then go to sea as third engineer. With 365 days' sea service, as engineer in charge of a watch, he can go up for examination; and if successful, he gets a second-class certificate, which entitles him to be second engineer (first assistant) of a ship of any size and power, or chief of a ship having engines less than 100 horse-power. The engineer who rises from a fireman is called a shovel engineer, or simply a shovel.

A story is told of a "shovel" chief who, when asked by the superintendent engineer of a New Castle line of steamers why he had taken no indicator cards, replied, "That blank fool of a second engineer I discharged last voyage lost the templet."

A candidate for examination was once asked, "What is a vacuum?" "A vacuum is a thing that goes siss" (drawing his breath in through his teeth), "and when you have twenty-six you're all right."

Apropos of vacuum, I was in the engine-room of one of the Clyde River steamers, speaking to the engineer one day, on the run from Greenock to Rothesay. Two well-dressed men stepped into the engine-room, and the one began explaining the engine to the other. When he got through, his friend said, "What are those little things like clocks for?" His chum replied, "The one with the hand pointing at 60 is a pressure gage, and indicates the pressure in the boilers; the other is called a vacuum gage. A vacuum is a space where there is no air; now the boilers are only partly filled with water; when the water boils, the space in the top of the boilers, which was occupied by air, becomes filled with steam, which drives the air out. Thus, as there is no air in this part, it becomes a *vacuum*, and this is where the vacuum gage becomes useful: for it is graduated in *inches*, showing how many inches the water is from the top of the boiler. If you come down here when we make the stop at Dunoon, you will see that, as the engines are stopped

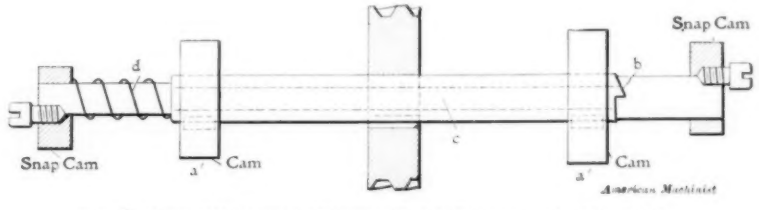


FIG. 6. SHOWING ARRANGEMENT OF SNAP CAMS ON CAM SHAFT.

and not using any steam, and consequently no water, the vacuum gage needle will gradually fall from 24 inches, where it now is, showing that the pumps that feed the boilers are gradually filling the boilers up to the top."

I asked an engineer on one of the ferry-boats one time what a vacuum was. He said, "They say it's nothing; but they can't tell *me* that nothing shows *a pressure of 26 pounds.* I tell you the directors of the —— Railroad don't pay for *pressure* gages to measure the *pressure* of *nothing.*" E. A. SUVERKROP.

Methods of Clamping Adjustment Screws.

Editor American Machinist:

Many cases arise in machine design and construction where it is desired to obtain a fine adjustment by means of a screw, which screw, when thus adjusted, must be securely held. The most common way is to use an ordinary set-screw with a check-nut to hold it. This often makes a clumsy arrangement. It calls for a longer screw than would otherwise be necessary; the screw head is one size and the nut another, and the tendency of the nut, when it is being tightened, to turn the screw is sometimes very exasperating. Also, in some situations it is very difficult to get one wrench on the screw head and another on the check nut and put enough muscle onto it to tighten the check nut securely.

I believe that in most cases some one of the various forms shown in the sketch may be used with greater accuracy and convenience. In all of these the clamping is accomplished without any tendency to disturb the setting of the adjusting screws. Fig. 1 shows a set, or adjusting screw, tapped through a lug, which is afterwards sawed through on one side and a clamping screw applied to tighten the adjusting screw after it is set. A series of screws may be held as in Fig. 2, in which the clamping cap is sawed off after all the drilling and tapping is done in such a way as to leave a half-nut for the adjusting screws, and somewhat less than half for the clamping cap. The cap may of course be made separate and may be faced and bolted solid to the other piece before the holes for the adjusting screws are drilled and tapped. Then facing a little more off the cap leaves it right for clamping the screws securely.

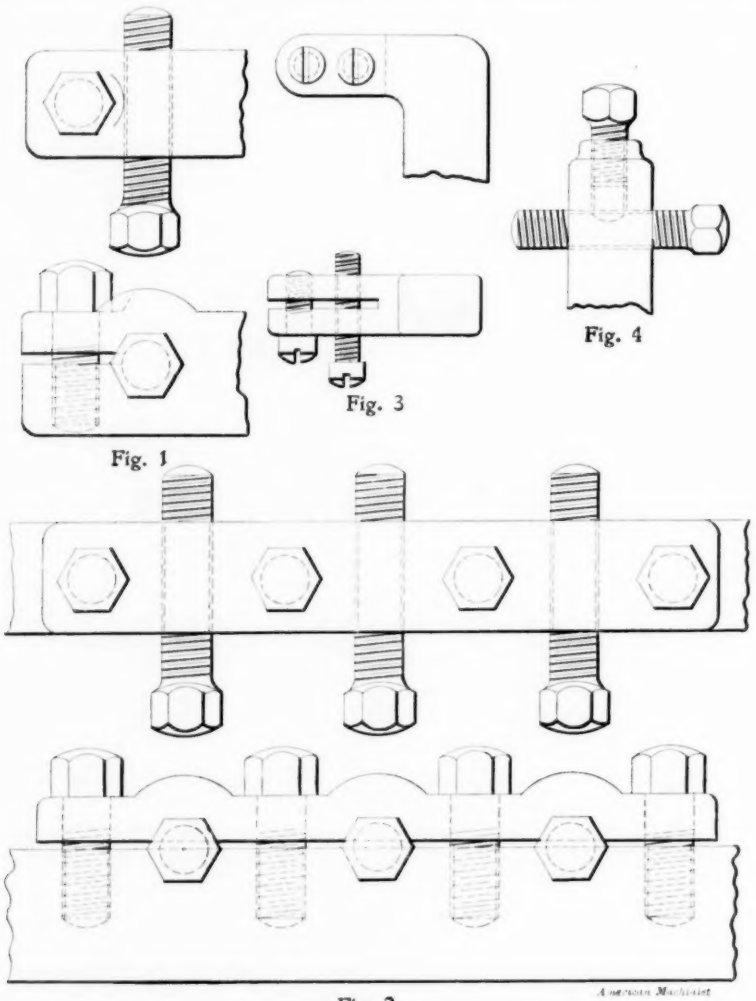


Fig. 1

Fig. 4

Fig. 3

Fig. 2

METHODS OF CLAMPING SCREWS.

Another neat device, much used on textile machinery, is shown in Fig. 3. In this case the adjusting screw nut is split in a plane at right angles to the axis of the screw, and the nut is pinched or compressed axially to clamp the screw. This design is especially useful in close quarters as the heads of both screws point in the same direction.

Fig. 4 shows an adjusting screw with a clamping screw at right angles to it, a plain brass plug slightly less than the tap drill size being inserted under the clamping screw to prevent burring the threads of the adjusting screw.

In designing any of the above devices the heads of both adjusting and clamping screws should be so that the same size wrench or screw-driver will complete the adjustment. F. C. BLANCHARD.

The American Machinist Burd o' Freedum.

Editor American Machinist:

Our boys have been kicking about the high-flying machinist who, with monkey-wrench and chipping hammer, distracts the attention of the recipients of your stationery. There is a general air of distracted incongruity pervading his frantic *ensemble,* which has been called to our attention so many times that silence is no longer possible. Various plans for improving his personal appearance have been advanced. A suit of overalls seems to be the most pressing necessity—both to prevent him from again running his tail through the back gears and to do away with the need for the shield (which we presume is an adaptation of the classic fig-leaf). A nail-keg to sit on is also badly wanted, both to give a more realistic air of repose and to remove the stigma of having no visible means of support.

But he is a back number at best, with his old-time wrench and hammer, and only serves to give a provincial appearance to otherwise unexceptional press-work. As an American machinist, I respectfully suggest that he be retired on half-pay and that no successor be appointed. E. J. ARMSTRONG.

[As there may be others who think as brother Armstrong does (in fact, we have heard from one or two others), it may be well to mention that this bird represents the results of careful study by an artist and student of heraldry, who is so little used to having his work in that line criticised that we shall carefully conceal from him the fact that a mere machinist has presumed to do so. To touch a feather of this bird would be the rankest heresy. He might be retired on half-pay—or no pay; but to remove his bed-ticking apron (which Mr. A. calls a shield) and put him in overalls, or to disarrange the symmetry of his tail feathers by attempting to make him sit on a nail-keg, would be an act of vandalism. Our bird needs no means of support, visible or otherwise; he supports himself and all his dignity besides. We

print him here as he appears on our letterheads, so that our readers may judge what ought to be done with him.—Ed.]

Developing a Man-Hole Facing Machine.

Editor American Machinist:

Referring to the notice by W. L. Schellenbach in your issue No. 3 to the writer's article on "Manhole-Facing Machines," will say that the machine described was designed and built some three years ago and without any knowledge on the part of the designer—at least so far as the writer is aware—of the existence of any similar machine.

The writer certainly was under the impression, up to the time of seeing Mr. Schellenbach's notice, that the principal feature of the machine, viz., the flat cutter, was original with himself.

H. P. G. Norstrand.

Brooklyn, N. Y.

Maudslay.

Editor American Machinist:

I note in your report of the death of Charles Sells, that your proofreader has allowed the name of Maudslay to be rendered "Mandslay," thus obscuring the facts to those not fully familiar with the career of that wonderful mechanical genius, who rightfully earned all the homage the world of mechanics can bestow. Why "Rare Ben Johnson," because he wrote some plays, and not "Rare" Henry Maudslay, who stamped the modern character of an entire industrial world?

C. C. Hill.

Elswick Employees.

Editor American Machinist:

In your notice of the death of Lord Armstrong, you speak of the Elswick Works as employing 3,000 men. This must be an error, as 30,000 would be nearer the actual number. T. B. P.

The Selden Patent on Automobiles.

Editor American Machinist:

It seems to me that in your comments regarding the Selden "master patent" for gasoline vehicles, in No. 2, you miss one of the chief points of the controversy.

If Selden had been a bona-fide inventor, endeavoring seriously to solve the problem of a working road vehicle, it is wholly improbable that even the legal twists by which he contrived to date it ahead sixteen years would have resulted in so general and indignant a determination on the part of the builders to resist his pretensions. As a matter of fact, while he was evidently aware from the first of the great possibilities of a "road locomotive with a liquid hydrocarbon gas engine," it does not appear that he ever troubled himself with the construction of an actual vehicle, or even with its theoretical development beyond the bare requirements of the Patent Office. Not one detail of the motor, or the running gear, by which they are supposed to be adapted to each other, is or ever was of the slightest technical value, and the general character of the thing is well enough summed up in the motor, which, as shown in the drawings, is actually inoperative because it has no flywheel!

So well is the general worthlessness of the minor claims understood that the battle has narrowed down to the question whether the application of a compression gasoline engine, with its necessary complements of fuel tank and clutch, to a road vehicle previously propelled by steam or by a non-compression gasoline engine, is *per se* any more a patentable novelty than the same combination would be if applied to a power pump or a threshing machine.

That George B. Selden, patent lawyer, should attempt by sharp practice to levy toll on an industry which he never lifted a finger to create or foster has, of course, no bearing on the legal aspect of the case; but, nevertheless, it will explain why there is so little disposition to treat him as a deserving and misunderstood inventor. So far from that, there is a very general hope that this claim of "any suitable motor or any suitable running gear with any suitable clutch" will be accorded the short shrift which to any non-legal mind it must seem to deserve.

As to whether or not master patents should be issued on gasoline inventions, it is not apparent how that question is involved at all. Herbert L. Towle.

Trade-Mark Axioms.

In a case recently decided by the United States Supreme Court covering the trade-mark laws of this country, Chief Justice Fuller delivered the opinion, in the course of which he called attention to several salient points. Attention was first called to the early use of the term "trade-mark," and its meaning as a distinctive mark of authenticity, through which the products of particular manufacturers or the vendible commodities of particular merchants may be distinguished from those of others.

A trade-mark may consist of any symbol or any form of words, but as its office is to point out distinctively the origin or ownership of the articles to which it is affixed, it follows that no sign or form of words can be appropriated as a valid trade-mark which, from the nature of the fact conveyed by its primary meaning, others may employ with equal truth and with equal right for the same purpose. A general rule has also been established to the effect that words that do not in and of themselves indicate anything in the nature of origin, manufacture or ownership, but are merely descriptive of the place where an article is manufactured or produced, cannot be monopolized as a trade-mark.

Another well-known doctrine governing trade-mark law is that no one can apply the name of a district of country to a well-known article of commerce, and by so doing obtain any exclusive right to such application as would prevent others inhabiting the same district or dealing in similar articles coming from that district from truthfully using the same designation. However, where a geographical name has acquired a secondary signification, its use in that sense may be protected by restraining the use of such word by others in such a way that it would amount to a fraud on the public, and on those to whose employment of it special meaning has become attached.

It may be granted, therefore, that the manufacturer of particular goods is entitled to the reputation they have acquired, and the public is entitled to the means of distinguishing between those and other goods; protection is accorded against unfair dealing, whether there be a technical trade-mark or not. The essence of the wrong consists of the sale of the goods of one manufacturer or vendor for those of another.

In a trade-mark suit if the plaintiff has the absolute right to the use of a particular word or words as a trade-mark, then if an infringement is shown, the wrongful or fraudulent intent is presumed and although allowed to be rebutted in exemption of damages, the further violation of the right of property will be restrained. Where an alleged trade-mark is not in itself a good trade-mark, but the use of the word has come to denote the particular manufacturer or vendor, relief against unfair competition or perfidious dealing will be awarded by requiring the use of the word by another to be confined to its primary sense by such limitations as will prevent misapprehension of the question of origin. In the latter class of cases such circumstances must be made out as will show wrongful intent in fact, or justify that inference from the inevitable consequences of the act complained of.

A. F. Tennille.

The most remote club of railway employees that we know of in America is one that seems to have been recently organized at Skaguay, Alaska. It is known as the White Pass Employees' Club and is composed of the employees of the White Pass & Yukon Route.

Personal.

S. Fischer Miller, formerly with Messrs. Milliken Bros., will hereafter be in charge of the New York contracting office of the American Bridge Company.

Richard Thirsk, who for some time past has been consulting engineer in Alabama and Georgia, has been appointed superintendent of the National Elevator and Machine Company, of Scranton, Pa., and will assume charge February 1, 1901.

W. H. A. Davidson, who has been selling Lundell Electric Motors ever since they have been on the market, has gone from the New York office of the Sprague Electric Company, to take the management of a new one which the company has opened in Baltimore.

Charles Churchill, of London, has been here for about a month past, accompanied by Mrs. Churchill and daughter. They sailed for home, Saturday, the 19th. This trip was not a business one, but was solely to enable Mr. Churchill to spend Christmas with his aged mother and to visit other relatives.

A. J. Major, formerly manager of the bridge and construction department of the A. & P. Roberts Company, has been appointed by the American Bridge Company manager of all its Eastern plants, which have been grouped in one section and which include the following: The Pencoyd, the East Berlin, the Buffalo, the Edge Moor, the Elmira, the Groton, the Hilton, the Horseheads, the Trenton, the Post & McCord, the Rochester and the Union plants.

Obituary.

The death is announced of George Birch, head of the firm of G. Birch & Co., of Manchester, England. Mr. Birch was a well-known inventor and builder of fine amateurs' lathes and other tools and was an excellent mechanic. Some of his tools were illustrated and described in our columns in 1899.

Thomas Shaw, an inventor and called by his friends "the Edison of Pennsylvania," died at Hammonton, N. J., January 19. His home was in Philadelphia. He had taken out 186 United States patents covering 91 subjects, among which were a mercurial steam gage, noiseless exhaust, the Verona lock-nut and washer, a dead-stroke hammer and the Shaw gas tester or detector for mines.

Philip James, a lifelong worker in iron and steel mills, died at Allegheny, Pa., January 14, eighty-eight years old. He was born in Wales, and he began sweeping off plates in an iron mill when seven years old. He was later in charge of a furnace, and when nineteen he assisted in making the first T rail at the Dowlias Iron Works, Glamorganshire. He came to this country in 1837, first finding employment as a puddler at Haverstraw, N. Y. In 1843 he went to Pittsburgh. During the Civil War he was manager of Pennsylvania Forge; in 1869 he managed a mill at Irondale, Ohio, and he rounded out his fifty-seven years of rolling-mill work as night boss of puddlers in Oliver's Woods Run Mill. The judgment of "Phil" James is said to have been highly valued among mill owners. Smallness of stature was considered to have hindered his advancement.

Inquiry for Machinery.

(140) Wanted, names and addresses of manufacturers of machines for straightening square and hexagonal bars up to 1½ inches.

The Essen Chamber of Commerce, in its annual report, admits that the change in Germany's business situation came from the United States.

The New York Central Railroad has made an advance of 10 per cent. to machinists in its shops at Oswego, N. Y.

Manufacturers.

Dowd & King, Charlotte, S. C., will erect a factory for plumbing and heating supplies.

The New Iberia (La.) Cotton Milling Company has decided to erect a knitting mill.

The Yardley (Pa.) flour and feed mill was burned recently; loss estimated at $40,000.

The firm of D. D. Lefavour & Co., Salem, Mass., will erect a four-story shoe factory.

The Barnsville Manufacturing Company, woolens, Fairmount, W. Va., will enlarge its plant.

The Asheboro (N. C.) Wood & Iron Works, destroyed by fire a few months ago, are being rebuilt.

The Southern Engine & Boiler Works, Tenn., is to make improvements, which will cost $30,000.

It is understood that the Proctor Furniture Company is building a $20,000 plant at Knoxville, Tenn.

An addition will be built to the plant of the National Spring Bed Company, New Britain, Conn.

The Keystone Farm Machine Company, Limited, York, Pa., is building an addition to its foundry.

A new foundry is to be built by Charles F. Ernst on Lathrop street, Buffalo, N. Y., to cost $3,600.

E. and Elisha Downing, of Castleberry, Ala., are negotiating to erect a cotton factory to cost $100,000.

The scythe handle factory in Waterville, Quebec, of J. R. Ball was burned recently; loss, about $20,000.

The Chase Machine Company, Cleveland, O., is understood to be about to put up a new building on Main street.

The Cleveland (O.) Stamping & Tool Company proposes to erect a brick factory on Hamilton street, to cost $5,400.

The McKeesport (Pa.) Cold Storage & Ice Manufacturing Company has broken ground for the erection of a large plant.

The Milwaukee (Wis.) Light, Heat & Traction Company will, it is stated, put up a power plant in South Milwaukee.

The United States Machine Company, Williamsport, Pa., are in the market for a complete equipment for a machine shop.

The work on an addition to the Larkin Soap Company's plant in Seneca Street, Buffalo, N. Y., is progressing rapidly.

The directors of the Akron (O.) Belting Company are considering plans for an increase of the capacity of the plant.

A two-machine tissue-paper mill will be added to the plant of the Wassau Paper Company at Brokaw, near Wassau, Wis.

It is rumored that the Pittsburgh (Pa.) Stove & Range Company has purchased a site for a new factory at New Castle.

A $100,000 cotton mill enterprise is being organized at Cuthbert, Ga. A. Hood is chairman of the committee to raise capital.

The Lewis Spring & Axle Company, of Jackson, Mich., is arranging to rebuild its plant, which was lately destroyed by fire.

Plans are about to be started for a $600,000 cement plant to be constructed for the Tatamy Cement Company at Nazareth, Pa.

The Grand Rapids (Mich.) Stave Company will build a boiler-house in which will be installed a boiler of 150 horse-power capacity.

The Skinner Chuck Company, New Britain, Conn., will erect an addition, which, it is said, will double its manufacturing capacity.

It is understood that the Appleton Manufacturing Company, maker of agricultural implements, will build a new plant at Batavia, Ill.

An addition is to be made to the Shiffler Bridge Works at West Homestead, Pa., during the coming spring at a cost of about $500,000.

The Leather & Brass Manufacturing Company, Seneca Falls, N. Y., is moving its plant to Auburn. The company employs sixty-six men.

The New Castle (Ind.) Coil Hoop Company is installing additional machinery in its plant, and is in the market for a second-hand blower.

The Concord Manufacturing Company, Penacook, N. H., states that our announcement that it will build an addition to its mill is incorrect.

H. Barker & Co., starch manufacturers, with headquarters at Boston, Mass., are having built for them a new factory on California street, Newton, Mass.

The Gould Storage Battery Company and Gould Coupler Company, 18-20 West Thirty-fourth street, New York, will extend their plants at Depew, N. Y.

The Buffalo Foundry Company, of Buffalo, N. Y., has been chartered; capital, $10,000. Directors: C. F. Dunbar, W. J. Hayes and Ernest Rippel, of Buffalo.

A sheet mill is to be established at Canton, O., by W. J. Steele and others, of that place. Mr. Steele was formerly connected with the Canton Roll & Machine Company.

It is believed that the American District Steam (Heating) Company will erect a plant for the manufacture of its supplies outside of Lockport, N. Y., its headquarters.

The Fawcus Machine Company has been granted a permit to build a brick machine shop, to cost $3,500, on Smallman street, near Twenty-eighth street, Pittsburgh, Pa.

At Reading, Pa., the Reading Iron Company will erect one of the largest and best equipped skelp mills at that place. At the same place the National Brass & Iron Company is having drawings made for a brick and iron addition to be built to its plant.

The Clarkwell Manufacturing Company, of New York, has purchased property at Camden,

N. J., and will erect a factory building of brick and iron, with power equipment.

A new cotton mill, to be financed by the Oklahoma Land & Industrial Company, Oklahoma City, Okla., is understood to be proposed by F. W. Smith, of Houston, Tex.

The Globe Furniture Manufacturing Company, Evansville, Ind., will add two new additions to its factory in West Maryland street, costing $20,000, between now and May 1.

George E. Nicholson, zinc smelter, Iola, Kan., has ordered material for two additional blocks of retorts, and is considering a rolling mill and acid plant in connection therewith.

A building permit has been granted the Friedman Bros. Shoe Company for a six-story factory, about 77x130 feet, at Jefferson and Madison streets, St. Louis, Mo.; cost, $40,000.

The new car shops of the New York, New Haven & Hartford Railroad are to be established just on the outskirts of Dedham, Mass. Probably 400 or 500 hands will be employed.

M. J. Morehouse has completed plans for a factory to be built at Chicago Highlands, Ill., for the American Novelty Castings Company. It will be 550x110, and will cost $50,000.

On a contract for a pump plant at the Cincinnati city water-works, approximating $1,000,000 in amount, the Camden Iron Works, Camden, N. J., were the lowest bidders.

The National Lead Company has bought 143x150 feet of land on Eighteenth street and the Chicago, Burlington & Quincy Railroad, Chicago, to extend its factory and warehouse plant.

The Meehan Boiler & Construction Company, Lowellville, O., is adding largely to its machinery equipment. A large bending and straightening machine has lately been ordered.

It is reported from Williamsport, Pa., that Trexler & Terrill have purchased tracts of hardwood timber in the vicinity of Laporte, and will erect a factory for barrels, tubs and firkins.

The Tempest Brick Company, at Manown, Pa., controlled by T. J. Evans, of McKeesport, suffered from a fire January 10. Plant No. 1 and the elevator and engine-rooms were destroyed.

Clapp Bros., hardware, lumber, etc., of Vicksburg, Mich., will add to their plant a boiler-house and a testing house with a 35 horse-power engine, a steam boiler and other machinery.

Fire, January 7, destroyed the car department building and contents at the Southern Indiana Railroad shop, Princeton, Ind. The loss is $30,000. The building will immediately be replaced.

A new power-house of the Haverhill, Southern New Hampshire, Lawrence & Methuen Street Railway, will be erected near the Salem (N. H.) depot. The building will cost about $20,000.

Schoen & Glattle have been awarded the contract for a factory building on Allegheny and Kensington avenues, Philadelphia, Pa., for Hirst & Rogers, of that city, Brussels carpet manufacturers.

The Farmers' Fertilizer Company, Limited, with a capital of $10,000, has been formed at York, Pa. The president is Benjamin S. Heindle. A plant is now being fitted up to make bone phosphates.

The Central Station Heating Company, Cincinnati, will erect a station at Grand Rapids, Mich., which, it is said, will be followed by four others there, aggregating a cost of over $600,000.

The directors of the Mineral Ridge (O.) Mine Supply Company, at a meeting held at Youngstown, have decided that a new 48x60-foot foundry be built in addition to the plant at Mineral Ridge.

The Merchants' & Planters' Oil Company, Houston, Tex., has decided to rebuild the oil mills which burned last September, entailing a loss of $400,000. The new plant will be much larger than the old.

Ground has been broken at Mamaroneck, N. Y., for the works of the National Sewing Machine Company, of New York. The factory will be in operation by June and will employ 200 men and boys.

(Continued on next page.)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 22.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer.Mach.T.Co.,Meriden,Ct.

Punches & dies. Wal.M.Wks.,Waltham,Mass.

Mfg.plants,space,powers,land. A.Ela,Boston.

Wanted—Modern, 15 in. stroke keyseating machine. Address Box 69, Franklin, O.

Gasoline motor castings; best jump-spark plug made. Orswell, 34 Beach, Boston.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J.L.Lucas,Bridgeport,Ct. Send for index sheet.

Parallel drawing-board attachments; by mail, $1.50; circulars. F. G. Hobart, Beloit, Wis.

F. J. Stokes Machine Co., 13th and Noble sts., Philadelphia, Pa., build light machinery.

Selden Packing for Stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., New York.

Send for circular of the Rich Handy Drawing Outfit; it is a great time-saver. J. & G. Rich, 120 N. 6th st., Philadelphia, Pa.

Manufacturers of sheave ropes for power-transmission are invited to send their addresses to P. T., Box 240, AMER. MACHINIST.

Drafting and designing quickly and accurately executed for firms not employing regular draftsmen, by Wallace & Co., P. O. Box 50, Newark, N. J.

Steam carriage and motor cycle constructor wishes correspondence with parties about to enter the automobile business. Box 250, AMERICAN MACHINIST.

$40,000 will secure estate's controlling interests in old-established and incorporated machine tool works, employing about 175 men. Box 218, AMERICAN MACHINIST.

Estimates on water, gas and electric meter indexes, in whole or parts; special clock movements; small tools and dies; gear work a specialty. Smith Novelty Co., 28 Commerce st., Trenton, N. J.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

A well-equipped machine shop and foundry, with ample water power, capacity 50 mechanics, tools suitable for engine building up to 24x24-inch or similar work, invites proposals in their line, or will consider manufacturing new specialties. Address P. O. Drawer 414, Lockport, N. Y.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Mechanical draftsman wishes to change. Box 252, AMERICAN MACHINIST.

Mechanic on math. & elec. instruments desires position; German; 35. L. S., AM. M.

Draftsman; references some best engineers in U. S. "Draftsman," 433 Dekalb av., B'klyn.

Draftsman wants position; graduate; object, experience; moderate salary. B. E., Box 251, AMERICAN MACHINIST.

Experienced patternmaker wants change as foreman or assistant; small work preferred; ample references. Box 241, AMER. MACH.

First-class draftsman, designer and practical mechanic, technical graduate, wants to change position. Box 249, AMER. MACHINIST.

Many years' experience as toolmaker, designer, inventor, foreman; would change; specialties preferred. Box 248, AMER. MACH.

Wanted—By foundry foreman, foremanship of foundry making engine castings or general jobbing, heavy or light. Address Box 178, AMERICAN MACHINIST.

Mechanical engineer, age 38, 20 years' experience, 15 as manager and superintendent in machine and foundry business, desires a position. Address Box 247, AMER. MACH.

Mechanical engineer desires change; technical education and 15 years' experience; specialist in mining machinery and steam engineering; excellent record. Box 214, A. MACH.

Mechanical engineer, sober, reliable and competent, having had long experience in charge of men, machinery and power plants, desires a change of position. Address Box 227, AMERICAN MACHINIST.

Position as foreman wanted, by thorough machinist and toolmaker, used to building high-grade work by the interchangeable system; up-to-date tools and fixtures designed. Address Z. N., AMERICAN MACHINIST.

A thorough mechanic, technical education, good executive ability and wide engineering experience, desires change of position, as mechanical superintendent or chief engineer with up-to-date concern, when opportunity can be had. Box 246, AMERICAN MACHINIST.

Technical graduate, 28, with 7 years' practical experience in shop and drawing room on mill and general machinery, tools, jigs and fixtures, desires position; familiar with best shop practice, estimating and systematizing; careful and energetic. Box 225, AM. MACH.

Wanted—Position as superintendent; capable of organizing and handling a machinery plant in all its branches; am a designer of special and automatic machinery, tools, jigs, fixtures for the rapid and economical production of interchangeable work. W. H. S., AMERICAN MACHINIST.

Technical man, practical, all-around machinist, die maker and machine designer, familiar with modern foundry practice, mixing, capable of doing his own chemical analysis, handling men, figuring costs and purchasing supplies, desires position as superintendent or mechanical engineer; references. Box 238, AMERICAN MACHINIST.

Mechanical engineer, Associate Member A. S. M. E., with extensive experience in modern shop management, envelope, paper bag and small automatic machinery, small high-speed engines, blowers, etc., desires position as superintendent or as draftsman and designer; capable of organizing or reorganizing a machine plant according to modern practice. Box 239, AMERICAN MACHINIST.

Help Wanted.

Wanted—Reliable draftsmen on special machinery; state experience and salary expected. Address "Buffalo," care AMER. MACHINIST.

Wanted—Immediately, two first-class draftsmen on hoisting machinery and engine work. Address A. B. C., care AMERICAN MACHINIST.

Wanted—A thoroughly competent pump salesman; an excellent salary will be paid to the right party. Box 236, AMER. MACHINIST.

Wanted—Two all-around job-shop machinists, conscientious and capable; men not above 30 years of age preferred. Box 244, A. M.

Wanted—For a few months, a mechanical draftsman with practical ideas. Address, stating experience, Greenfield Machine Co., Greenfield, Mass.

Wanted—Good mechanical draftsman, by a manufacturing concern near New York city; state experience and salary desired. Box 237, AMERICAN MACHINIST.

Wanted—Experienced traveling salesman; good theoretical and practical mechanical experience; references and terms required. Box 217, AMERICAN MACHINIST.

Wanted—A superintendent of machine shops in Western city near Chicago; must

(*Continued from preceding page.*)

Plans have been filed for a new grain elevator, to be erected by the Storage Elevator & Milling Company at Starkey and Plato streets, St. Paul, Minn. It is to be 58x70 feet, and will cost $45,000.

A stock company has been organized at Sharon, Pa., and will purchase the old Kimberly rolling mill owned by the American Steel Hoop Company, and will convert it into a foundry and machine shop.

Plans have been prepared for enlarging the plant of the Cornwall & Paterson Manufacturing Company, maker of piano and organ hardware, Fairfield and Bedford avenues and State street, Bridgeport, Conn.

Glass blowers, cutters, flatteners and gatherers of Hartford City, Ind., and other points have organized a co-operative company, and will establish a twelve-pot factory there, with a capital of $25,000.

J. B. Jones & Bro., scrap iron dealers, Allegheny, Pa., are increasing the capacity of their yards and putting in new machinery. At present they want machinery for cutting and threading wrought-iron pipe.

The Cochrane Manufacturing Company, Walnut Hill, Mass., carpets, velvets and tapestry, will make an addition to its plant. Nearly 200 more hands will be employed in addition to the 300 already at work.

The Oyster Bay Engine Company, of Oyster Bay, Nassau County, N. Y., has been incorporated; object, manufacturing machinery; capital, $30,000. Directors: D. D. Smith, T. W. Burt and John Titus, of Oyster Bay.

The Pressler Well & Core Drilling Machine Company, Third and Plum streets, Cincinnati, O., is fitting up a plant for making drilling machinery, and was recently reported as in the market for a 32-inch lathe and a 24-inch planer.

Sidney Shepard & Co., metals and sheet-metal goods, Buffalo, N. Y., have bought land on which they will erect a three-story factory, 125x100 feet as well as a warehouse, and will use it in making enameled or "granite" ware.

Plans have been prepared for buildings for the McLaughlin-Martin-Parkhurst Company, Canandaigua, N. Y. They show a factory, 70x150 feet, two stories high; also a power-house, two stories high, and an enameling plant.

George F. Payne & Co., Philadelphia, Pa., have plans on the boards in the Juniper street offices for a power-house to be built for the Philadelphia & Reading Railroad Company, at Reading, Pa. The plans were made by the company.

An oil mill in Greenville, Tex., of which J. B. Dale, Jr., is manager, lost its main building by fire January 8, the machinery contained being badly damaged. The original cost is estimated at $70,000. It will be rebuilt at once.

It is reported in Pittsburgh that A. J. Malorkey, an oil man, contemplates erecting a brick manufacturing plant at Hite station, Pa., on the West Penn Railroad. About $15,000 will be put into the enterprise, and 20,000 bricks turned out daily.

(*Continued on next page.*)

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Help Wanted—Continued.

have good references. Address, giving class of work heretofore engaged in, Box 242, A. M.

Wanted—Model and experimental men, about 35 years of age, familiar with work such as cash register and typewriter; state where worked and wages expected. Box 245, AMERICAN MACHINIST.

Wanted—Experienced mechanical draftsmen. Apply, giving age, record, references and salary required, to Engineer Drafting Dept., General Electric Co., Schenectady, N. Y.

Wanted—Two good toolmakers; one making tools for working on iron, the other on tools for brass; give references, experience and wages wanted. The Goulds Mfg. Co., Seneca Falls, N. Y.

Wanted—Machine tool salesman for cities of New York, Pittsburgh and Cleveland; local resident, acquainted with the trade, preferred; write, stating experience and giving references. Address Box 202, AMER. MACHINIST.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite application from pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

General superintendent wanted for new valve shops in Canada; a first-class man, experienced in every department of work in iron and brass, will be treated liberally. Apply at once, National Iron Works, Ltd., 20 King st., East, Toronto, Canada.

Wanted—General manager of machine shops, foundry, etc., employing 800 men; a good opening for a man of experience with ability in both mechanical and executive departments. Address, with references and advise past experience, Box 243, AMER. MACH.

Wanted—First-class machinists, vise hands, floor hands, machine hands; have lately increased our plant and can offer good men steady jobs and good pay; good, healthy town and cheap living. Write fully, American Mach. & Foundry Co., Hanover, York Co., Pa.

Wanted—Chief foreman for machine shop of 80 men on medium heavy machine tools and light special machinery; none with less than 6 years' actual experience as foreman need apply; state age, experience, naming shop and time employed as foreman. Address Box 224, AMERICAN MACHINIST.

A first-class mechanic who is thoroughly acquainted with refrigerator and ice machines and has experience in putting up plants of the Plate ice system, wanted to go abroad; one who also speaks German preferred; state age, nationality, experience, references and salary expected. Address Box 207, AMER. MACH.

WANTED

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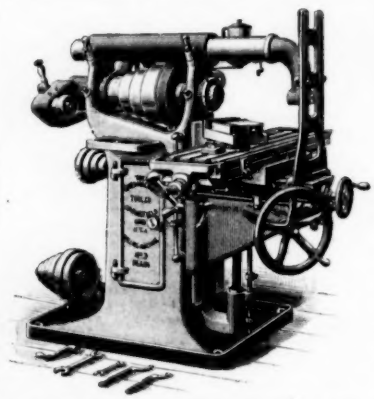

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